ONTARIO PARKS

Presqu'ile Islands

2011 Resource Management and Monitoring

Ontario

Cover Photo: Bluff Thicket North, High Bluff Island, is composed of living and dead trees and shrubs that provide habitat for a variety of nesting and migrating birds.

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MNR 62746
ISSN 1927-6753 (Online)
ISBN 978-1-4435-8334-3 (PDF, 2011 ed.)

Overview

Resource management on High Bluff and Gull Islands at Presqu'ile Provincial Park (**Figure 1**) is prescribed by the 2011 *Presqu'ile Islands Resource Management Implementation Plan* (Islands RMIP). The overall purpose of resource management is to maintain representative diversity of species and their habitats using an ecosystem-based adaptive management approach.

As described in the Islands RMIP, the treed portions of High Bluff Island have been affected in the past decade by double-crested cormorants (*Phalacrocorax auritus* – herein referred to as cormorant or DCCO) and white-tailed deer (*Odocoileus virginianus*). High Bluff Island was previously a mosaic of mature woodlots, shrubby thickets, and former agricultural fields. The mature woodlots are now scattered groves of live, dying, and dead trees and shrubs. Gull Island formerly supported trees and shrubs but is now essentially bare, except for one remaining willow tree on Sebastopol Point, due to past impacts of cormorants. The Islands RMIP describes resource management actions to address cormorant and deer impacts on specific park values and to maintain habitat for other species.

The islands also host three other tree-nesting colonial waterbird species: great blue heron (GBHE, *Ardea herodias*), great egret (GREG, *Ardea alba*) and black-crowned night-heron (BCNH, *Nycticorax nycticorax*). These three species are collectively referred to as "herons". Cormorants and the three heron species nest in the remaining scattered areas of woody vegetation on the islands, and have been closely monitored since 2003. Nesting gulls and terns, which are considered ground-nesting colonial waterbirds, are monitored on a longer-term cycle by the Canadian Wildlife Service and are not reported within this document.

From 2003 until 2007 management of cormorants occurred under the direction of the *Presqu'ile Management Strategy for Double-crested Cormorants*. Between 2008 and 2010 no management occurred but monitoring of colonial waterbirds and vegetation continued. In 2011 cormorant and vegetation management activities were conducted on High Bluff and Gull Islands under the direction of the Islands RMIP. This was the first year of implementation of this plan. All previous monitoring reports and management documents are available at http://www.ontarioparks.com/english/pres_planning.html.

The purpose of cormorant management is to prevent the loss of specific woody habitat areas and permit recovery of woody habitat. Specific desired outcomes are:

- maintenance of nesting habitat for great egrets and black-crowned night-herons, and roosting habitat for monarch butterflies
- no loss of specific woody habitat areas, including the remaining willow tree on Gull Island

Several specific woody habitat areas on the Presqu'ile Islands are identified as management areas in the Islands RMIP. These sites typically contain live woody vegetation and other resource values (e.g. heron nesting sites). **Figure 2** is an overview of High Bluff Island identifying the management areas where monitoring and management occurred, as well as heron nesting and vegetation monitoring locations.

This report describes the monitoring that was done on the Presqu'ile islands in 2011. Monitoring is done annually, in accordance with the Islands RMIP, to ensure that habitat is being maintained for a variety of species and to determine the effects of cormorant management activities. The information learned from monitoring helps park managers determine what resource management activities are needed to conserve and restore the island's live woody vegetation.

Monitoring and management methods, results, and discussion of the results and are presented in the sections described below. Each section answers a number of monitoring questions.

1. **Double-crested cormorant**
    - How many DCCO nests are there in trees and on the ground? How does this change from year to year?

- What areas are DCCO nesting in?
- How much roosting by DCCO is occurring (is it necessary to disturb roosting DCCO)?
- What cormorant management activities were conducted in 2011?
- How is cormorant management affecting the amount and location of cormorant nesting and roosting?

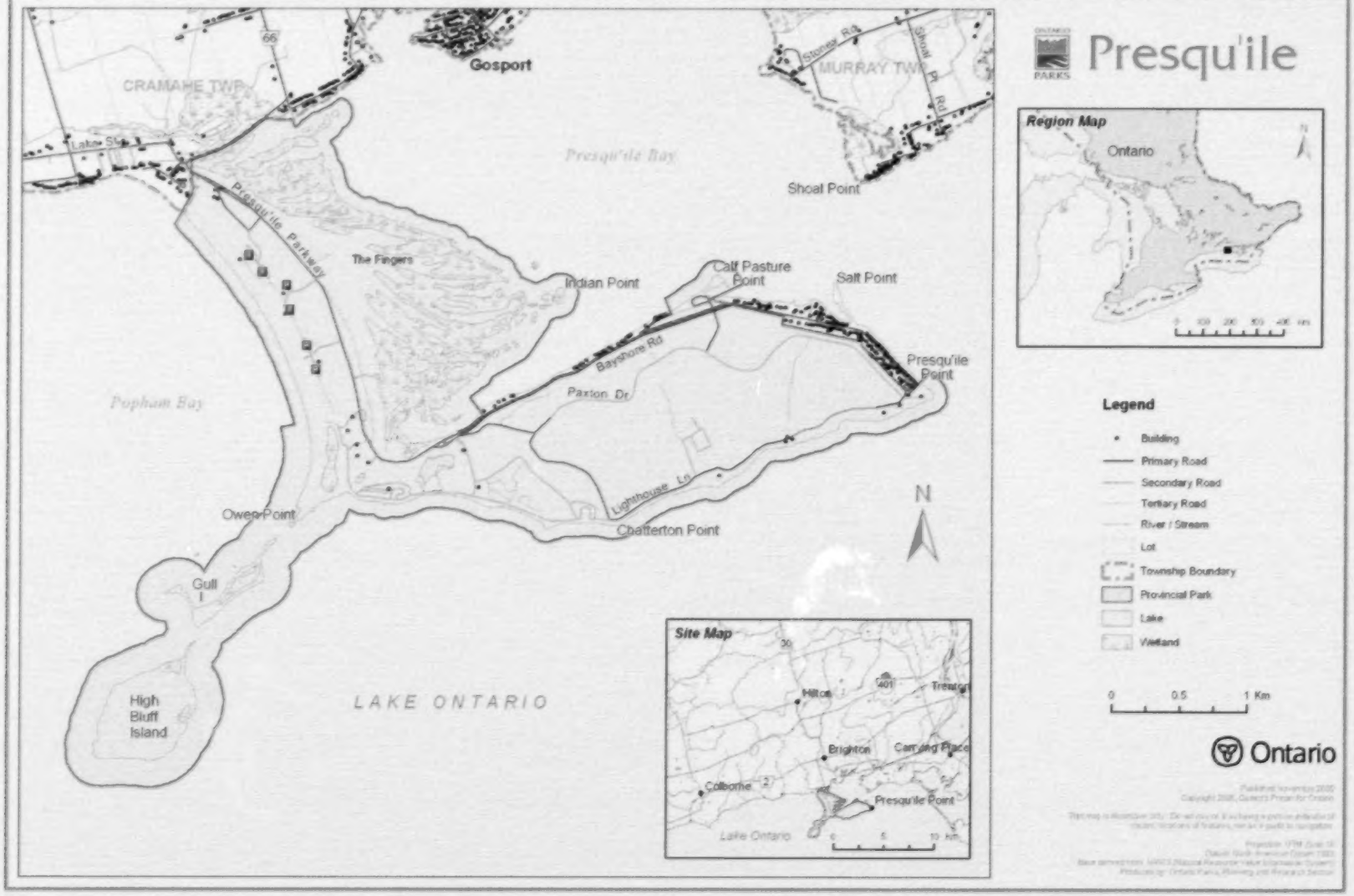
2. **Herons** – great blue heron, great egret, and black-crowned night-heron
   - How successful are the nesting herons? How does this change from year to year?
   - What areas are herons nesting in?
   - How much roosting by herons is occurring (is there a risk that cormorant roost disturbance could affect roosting herons)?

3. **Summary of regional trends** in tree-nesting colonial waterbirds for 2011
   - What are the trends for these species across Lake Ontario and elsewhere?
   - How does Presqu'ile contribute to the regional populations of these species?

4. **Vegetation**
   - What is the condition of the vegetation in representative habitat areas of High Bluff Island? How does it change from year to year?
   - How is vegetation condition affected by nesting DCCO?
   - Is woody habitat being maintained for nesting herons and other species?

5. **Other wildlife** – terrestrial colonial waterbird predators, white-tailed deer, monarch butterflies, and other birds.
   - How is the woody vegetation and other habitat on HBI being used by other wildlife species?

FIGURE # 1 REGIONAL SETTING



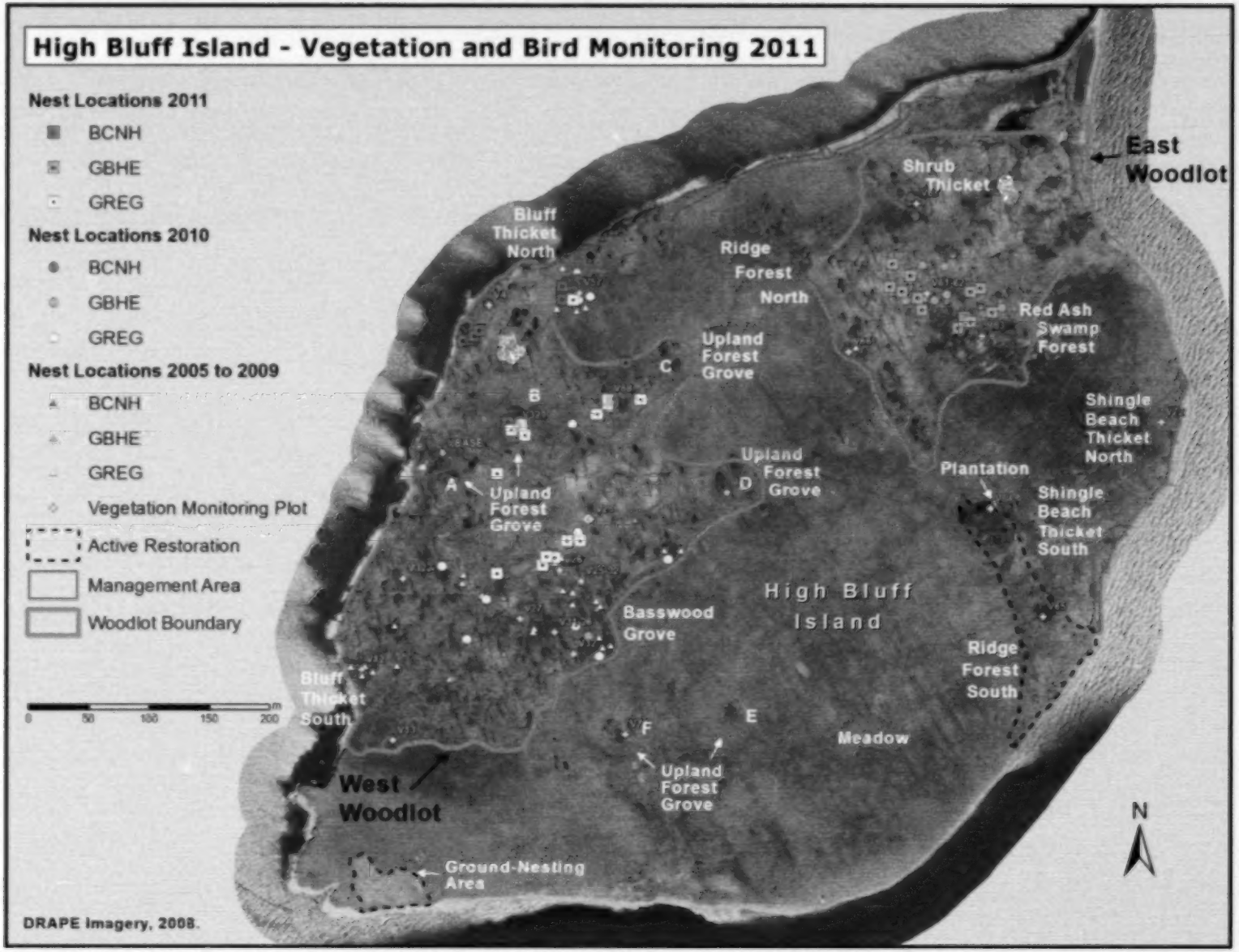


Figure 2. Management areas (from Islands RMIP), heron nesting locations from 2005 – 2011, and vegetation monitoring plots. The areas within the former east and west woodlots that are not encompassed by management areas are referred to as Unmanaged Area East and West, respectively. An individual point for heron nesting represents one tree, which may have multiple nests in it. UTMs were not collected for all heron nests each year and therefore this map is not a complete representation of heron nesting locations.

1. Double-crested Cormorant Monitoring and Management

DCCO nest counts are conducted annually to determine how many nests are in the trees and on the ground, what areas are being used, and how these change from year to year. Cormorant management was undertaken by two technicians assigned to this project full-time, with direction and assistance from a senior biologist. Waterbird nesting status and management activities are summarized in **Appendix A**.

1.1. DCCO Nest Counts

Methods

- Total counts of DCCO nests and the number of trees containing DCCO nests on the Presqu'ile Islands were conducted twice in 2011.
  - The first count, June 21 to 24, is consistent with the timing of the Canada Wildlife Service surveys and previous surveys; this week is considered the average peak of nesting in Lake Ontario
  - The second count, July 28 to August 6, quantified some of the changes in colony over the course of the breeding season
- In both counts the location of all trees containing cormorant nests was recorded (e.g. Red Ash Swamp, Shrub Thicket, Unmanaged Area-East etc.). All nests in an occupied tree were counted and the tree was marked to avoid double counting
- Tree health and structure was quantified for **all** DCCO nest trees during both nest counts (**see section 4**). These data will be examined during the 5 year review of the Islands RMIP.
- In previous years ground nests were counted but in 2011 there were no active DCCO ground nests during either count period.

Results

- Results from both 2011 nest count periods are provided in **Table 1**.

Table 1. Number of DCCO nests and trees used for nesting on High Bluff Island during both count periods in 2011.

	June 21 - June 24	July 28 – August 6
# of nests	3854	1690
# of trees	638	443
# nests/tree	6.0	3.8

- The number of nests decreased by 57% between the first count period and the second, and the number of trees used decreased by 30%.
- In 2010 the number of nests declined by 25% between the 2 count periods (from 4523 in June to 3393 in July), and the number of trees used decreased by 10% (from 724 in June to 646 in July).
- A microburst[1] event occurred on July 18, influencing the second 2011 DCCO nest count. This extreme weather event toppled 95 live and dead trees across HBI. Most of the trees were in the two unmanaged areas and Bluff Thicket North (**Appendix B**). 92 of the trees were being, or have been used as nest sites for DCCO. Not all DCCO nestlings had fledged. Hundreds of nestlings were either blown from their nests to ground, or killed as their nests and nesting trees fell. For weeks after the event large flocks of 50-100 DCCO nestlings were seen scurrying around the island. The dislodged nestlings that were not killed during the storm either succumbed to their injuries later (broken limbs), died of starvation, or were predated by fox.

[1] Microbursts are small, very intense storm-related downdrafts of air that can produce strong wind capable of reaching in excess of 160 kph, causing significant damage (http://en.wikipedia.org/wiki/Microburst).

Given the number of nests that were lost, up to 1000 DCCO nestlings may have died as a result of this extreme weather event. That said, the majority of the 2011 DCCO brood in the remaining nests did survive in their nests and fledged successfully.

Table 2. 2011 management area use, based on the June 21-24 nest count.

Management area	# nests in live trees	# live trees used	# nests in dead trees	# dead trees used	TOTAL DCCO NESTS	TOTAL TREES USED
Basswood Grove	525	187	73	21	**598**	**208**
Bluff Thicket North	30	6	8	2	**38**	**8**
Bluff Thicket South	33	11	2	1	**35**	**12**
Red Ash Swamp Forest	563	68	101	13	**664**	**81**
Ridge Forest North	108	4	13	2	**121**	**6**
Ridge Forest South	0	0	0	0	**0**	**0**
Shingle Beach Thicket (north and south)*	6	2	0	0	**6**	**2**
Shrub Thicket	0	0	0	0	**0**	**0**
Upland Forest Grove A	0	0	0	0	**0**	**0**
Upland Forest Grove B	2	1	0	0	**2**	**1**
Upland Forest Grove C	87	11	2	2	**89**	**13**
Upland Forest Grove D	0	0	0	0	**0**	**0**
Upland Forest Grove E	0	0	0	0	**0**	**0**
Upland Forest Grove F	0	0	0	0	**0**	**0**
Unmanaged Area - East	1012	97	801	125	**1813**	**222**
Unmanaged Area - West	230	61	258	24	**488**	**85**
2011 Total	**2596**	**448**	**1258**	**190**	**3854**	**638**
(2010 Total)	***3486***	***556***	***1037***	***168***	***4523***	***724***

*DCCO nests in Shingle Beach Thicket North and South were counted together instead of as two separate areas

- Approximately 60% of DCCO tree nests were found within unmanaged areas in 2011 (**Table 2**), outside the management areas defined in the Islands RMIP. The remaining nests were spread throughout 8 of the 14 habitat protection areas, with Upland Forest Grove B newly occupied by DCCO in 2011.
- DCCO used fewer trees in total in 2011 than 2010, and fewer live trees (**Table 2**). The proportion of trees used that were alive was 70% in 2011, and 76% in 2010.

Table 3. Cormorant nest numbers from 2002 to 2011. All data are from June nest counts.

Year	HBI tree nests	HBI ground nests	Gull I. ground nests	Total nests
2002	6893	3491	1698	12082
2003	4631	2948	1117	8696
2004	3656	1683	1601	6940
2005	1976	1305	1328	4609
2006	2108	498	213	2819
2007	2233	1562	60	3855
2008	3478	664	0	4142
2009	3756	116	0	3872
2010	4523	0	0	4523
2011	3854	0	0	3854

- There was a 15% decrease in total DCCO nests between the late June count in 2010 and 2011 **(Table 3)**. This decrease occurred entirely within the tree-nesting component of the population

in the management areas as there was no established ground colony in either year. The greatest decreases were in Basswood Grove, Ridge Forest North, and Shrub Thicket and were mostly due to nest removal (see Table 1 in 2010 report).

- The number of ground nesting DCCO declined dramatically from 2007 to 2009 and the DCCO ground colony was completely absent in 2010 and 2011. In 2011 ring-billed gull attempted to nest in the traditional ground colony area (on HBI) but the site was abandoned it by late May. The continued presence of red fox (**see section 5.1**) is likely deterring ground-nesting by DCCO and gulls.
- DCCO attempted to ground-nest on Sebastopol Point (Gull Island) in early June but these nests failed before the nest count periods.

Table 4. Number of DCCO nests and trees used for nesting on HBI from 2006 to 2011, based on the late June count. Live and dead trees were not recorded separately until 2008.

Year	# live trees used	# nests in live trees	# nests/ live tree	# dead trees used	# nests in dead trees	# nests/ dead tree	Total trees used	# nests/ tree
2006							377	5.6
2007							432	5.2
2008	449	2743	6.1	121	735	6.1	570	6.1
2009	571	3408	6.0	84	348	4.1	655	5.7
2010	556	3486	6.3	168	1037	6.2	724	6.2
2011	448	2596	5.8	190	1258	6.6	638	6.0

- Occupation of new live trees by DCCO has slowed down, with more dead trees used in 2011 (**Table 4**). Nests were packed more densely into the dead trees in 2011. This is likely due to a number of factors, including management moving DCCO out of the live tree areas, and fewer live trees remaining. The number of nests in live trees was the lowest it has been since this information was recorded
- DCCO nested in all tree species present on High Bluff Island in 2011 except American elm, red cedar and trembling aspen. DCCO also attempted to nest in the remaining willow on Sebastopol Point (**see section 1.2 – Tree nest removal - results**)
- The maximum number of nests observed in a single tree was 65, in a large red ash in the Red Ash Swamp Forest. In 2010 the maximum number of nests was 63 in a large red oak in Unmanaged Area – West.

Discussion

The number of DCCO nests in trees decreased over the course of the breeding season in 2011, and was less than 2010. Typically the total number of nests recorded during the July DCCO nest count is less than the June count, since late July is near the end of the breeding season. Some new nests may have been initiated after the June count, but many fledged or failed nests have fallen apart. The decline between the two count periods was pronounced in 2011 compared to 2010, mainly due to the microburst event (**Figure 3 – p. 14**). Relatively few nests were removed following the late-June nest count (**see section 1.2 – Tree-nest removal - Results**).
DCCO use of the management areas shifted in 2011, with greater intensity use in the unmanaged areas, and less use of the areas that were managed in 2011. A new area, Upland Forest Grove B, was occupied by DCCO in 2011 – management was not able to be conducted in this area this year (**section 1.2, Appendix A**).

The number of DCCO nests in the late June nest count declined between 2010 and 2011, most likely due to management efforts, especially in Shrub Thicket, Bluff Thicket South, and Ridge Forest North (**Appendix A**). Indeed, even though Presqu'ile's DCCO population declined, the lake-wide numbers increased (**see section 3**).

The ground-nesting colony on High Bluff Island once provided an alternative nesting site for up to 5,000 pairs of DCCO. Since a population of foxes has occupied High Bluff Island ground-nesting

by DCCO has dwindled to zero. The 20,000 pairs of gulls that once nested there are also gone, and many have moved to Gull Island and Sebastopol Point. Attempting to re-establish a ground-colony by excluding these terrestrial predators will be a priority in 2012. The lack of successful ground-nesting DCCO on Gull Island and Sebastopol Point is likely due to a suite of factors, including competition with nesting gulls, possible predator activity on Gull Island, and natural habitat changes on Gull Island that make it less attractive to nesting DCCO.

Use of live trees by nesting DCCO decreased substantially in 2011, likely due to a combination of management efforts and the ongoing loss of live trees on the High Bluff Island.

1.2. Tree-Nest Removal

Methods

- As specified in the Islands RMIP, nest removal did not occur if fully-laid clutches had passed 75% of their incubation period, as determined by tracking nest initiation dates (**Appendix A**).
- Cormorant nests were removed by pushing the nests from the trees with fibreglass forestry poles. These are square cross-sectioned poles in 8 foot (2.46 m) sections that are normally used by arborists for pruning.
- The number of sections and people required to do the poling depended on the height of the nests. Lower nests required less than 5 sections and one pole-person. Nests higher than 12 m from the ground required from 5 up to 8 sections of poles and a two-person poling crew to work most efficiently. One individual operated the pole while another provided sections and recorded data (**Figure 4 – p. 14**).

Results

- Between early May and early July 1121 nests were removed from 8 of the 14 management areas (**Table 5**). DCCO will attempt to re-nest when they lose their nest and sites were revisited to remove nests several times during management, so these numbers may represent multiple nesting attempts by the same pair of birds in some cases.
- Interestingly, despite management in Basswood Grove, where the June nest count was lower in 2011 than 2010, there were more nests present in late July 2011 than 2010. However, in Ridge Forest North intensive management resulted in far lower July counts in 2011 than 2010.
- Nest removal stopped in mid-July when most nests were past 75% incubation. Nesting had progressed too far (DCCO chicks heard) to initiate nest removal in the Red Ash Swamp, Bluff Thicket North and Upland Forest Grove B. Other management areas did not have nesting cormorants in 2011 (**see table 2, section 1.1**)

Table 5. Total number of DCCO nests removed from each management area and the number of nests present in those areas during the 2011 and 2010 late-July nest count.

Management Area	DCCO nests removed May – early July	DCCO nests late July 2011	DCCO nests late July 2010
Basswood Grove	370	359	290
Bluff Thicket South	125	0	N/A[1]
Ridge Forest North	437	11	191
Shingle Beach Thicket North	1	0	0
Shingle Beach Thicket South	30	6	0
Shrub Thicket	122	0	N/A[2]
Upland Forest Grove C	15	30	8
Sebastopol Point (Gull Is.)	21	0	0

[1] Late July nest numbers were not recorded separately for Bluff Thicket North and South in 2010
[2] Shrub Thicket was not counted in late July 2010 to avoid disturbing BCNH and large DCCO chicks

Discussion

The majority of DCCO management activities in 2011 focused on removing nests from the live woody vegetation within five of the designated habitat protection areas (**Appendix A**). This was largely because of the timing of the initiation of management activities. The most intensely managed areas were: Shrub Thicket, Bluff Thicket South, and Ridge Forest North. These sites were selected to concentrate nest removal efforts based on: 1) their previous nesting history by herons and egrets; 2) the quality of habitat for migrating birds and butterflies and; 3) the potential for recovery if kept free of nesting DCCO. Management in 2011 was effective in keeping these areas essentially free of DCCO nests throughout the nesting season (**see also Table 2, section 1.1**). There were far fewer nests in Ridge Forest North in late July this year than last year, and that is largely due to the next removal activities.

The Basswood Grove was managed periodically but the large number of nests in this large area could not all be cleared during the time available. The objective in this area in 2011 was to reduce the number of DCCO nests in the basswood trees that were most likely to provide habitat to a variety of species because of their condition, size, or location. The remainder of the Basswood Grove was not managed in 2011, and clearly the unmanaged portions of this area were attractive to nesting DCCO. This management area shows great potential for rapid recovery and utilization by nesting herons, passerines and roosting monarchs. In addition to being rapid growers, basswoods sucker tenaciously and some individuals seem to be able to persist for several years despite the effects of cormorant nesting (**section 4.2**) (**Figure 5 – p. 14**). It is anticipated that starting management earlier (April) in 2012 will allow all management areas with nesting DCCO to be effectively managed.

In 2011 DCCO attempted to nest in the willow on Sebastopol Point (Gull Island) (**Figure 6 – p. 14**). This also occurred in April 2007, prior to management activity beginning for that year. In 2011, DCCO were first noted nesting in this tree in early June. It is possible that these birds were displaced from nest sites on High Bluff Island. DCCO nests were removed from this tree throughout the 2011 breeding season, as they were in 2007. It is not known why DCCO did not attempt to nest on Sebastopol Point from 2008 to 2010, or in previous years.

Due to the importance of the Sebastopol Point willow tree for nesting BCNH it will continue to be monitored in future years, including prior to management. In 2011 it was demonstrated that DCCO nests can be removed from this tree without noticeable adverse affects on the BCNH that use this tree (**see section 2.3**).

2011 was the first year of implementation and management was not able to begin until after the breeding season had begun. In future years management will be initiated as early in the breeding season as possible (i.e. April). This will prevent DCCO from becoming firmly established in management areas, reducing nest removal effort overall.

1.3. Roost Monitoring and Disturbance

After the breeding season, DCCO become transient and hundreds or thousands of individuals from across a large region congregate in locations with feeding and roosting opportunities. DCCO roost overnight in trees or on the ground. Guano deposition from these large communal roosts can have a pronounced negative effect on woody vegetation.

Methods

- Monitoring of roosting DCCO was initiated in mid-August (**Table 6**). Surveys began one hour before sunset and ended 30 minutes after sunset. As in previous years, observers using binoculars were positioned on opposite ends of the island. All birds coming to roost from the

west, north, and east were clearly visible. Birds arriving from the south were partially obscured from view. No two points on the island offer a clear view of all potential return angles.
- Limited roost disturbance activities – human presence, yelling, and arm-waving – were employed at the onset of darkness on two of the evenings that roost monitoring was conducted
- While one individual was conducting roost disturbance activities another person observed the reaction of the birds and their destination after they had left the initial roost area
- Pre-dawn visits occurred on the morning following roost disturbance activities to determine if the displaced birds remained at the site they had relocated to the evening before

Results

- Results from roost monitoring are provided in **Table 6**.

Table 6. Numbers of DCCO arriving at High Bluff Island to roost for the night.

Date	Total # of DCCO	Majority of DCCO Arriving From
August 11	584	South
August 16	460	West and East
August 25	1245	West
September 8	226	East

- On August 11 and 25, when higher numbers of DCCO were observed roosting in management areas, the northern shoreline of High Bluff Island was traversed by staff who successfully roused the DCCO that had roosted in Bluff Thicket North, Shrub Thicket, and Upland Forest Grove A. Approximately 200 DCCO relocated to the north shore of Gull Island each time and did not return to High Bluff Island.
- No disturbance was conducted on August 16 or September 8 because the arriving DCCO did not roost in the trees and shrubs of the management areas, but rather in both unmanaged areas.

Discussion

Roost disturbance activities appear to have redirected roosting DCCO out of live vegetation in the management areas. In 2011 and 2010 DCCO preferred the north shore of Gull Island and Sebastopol Point as their favoured roosting location. Once this pattern is established it appears to continue throughout the roosting season, especially if roost disturbance occurs. If active (noise, human presence etc.) or passive (use of scarecrows) disturbance activities make tree-roosting sites undesirable, cormorants readily move to Gull Island. They also seem to be avoiding the areas where the staff are positioned for monitoring.

It appears that the islands at Presqu'ile are not acting as a regional roosting location for DCCO, given the relatively low numbers of DCCO that arrived at the island during roost monitoring in 2011.

1.4. Ground-Nesting Habitat Enhancement

The objective of enhancing the ground-nesting habitat was to provide suitable nesting sites outside of the management areas identified in the Islands RMIP. Much of the southwestern shoreline of High Bluff Island formerly supported a ground-nesting DCCO colony. However, for the last several years this colony has been unsuccessful – fewer DCCO attempt to nest there each year, and the nests that are established are quickly abandoned. One likely explanation is the fact that a self-sustaining population of red foxes (*Vulpes vulpes*) has become established on High Bluff Island, and their presence provides sufficient disturbance to prevent ground-nesting. To reduce the potential for predation by terrestrial predators like foxes an exclusion fence was erected as detailed below.

Methods

- A 15m x 50m section of the former ground colony area adjacent to the southwest shoreline was mowed to remove tall grass and then surrounded by a fox-exclusion electric fence (**Figure 7 – p. 15**). The area contained fallen woody debris, which ground-nesting cormorants are often attracted to.
- The fence has been designed based on methods used elsewhere[2].
- Three parallel strands of 2mm electric fence wire (each separated by 12.5 centimetres) were run off a Hallman Battery Saver 6900 electric fence charger and car battery.

Results

- Since the site was established in late-August of 2011 after the breeding season, no DCCO have established nests within the protected ground colony area.
- Ring-billed gull roosted on the site after the fence was established and DCCO roosted on the rocky shore adjacent to the protected ground colony area.

Discussion

The spring of 2012 will be the first opportunity for the fenced area to be used by ground-nesting colonial birds. It is not known if the currently fenced section of the ground colony is both large enough and secure enough to entice DCCO or other ground-nesting colonial waterbirds to use it. There is concern that DCCO may require more room to lift off the ground and attain flight. The fence running along the shoreline may interrupt the bird's ability to lift-off from within the exclosure. When taking off from the ground the birds tend to run into the prevailing wind and launch themselves off the shoreline out over the water. Standing 2 feet tall, the electric fence may block the bird's flight path. As such the dimensions and/orientation of the fenced area may need to be modified in 2012. The only realistic way to determine this is to watch DCCO behaviour in real-world conditions.

The predator-proof nature of the compound has not been tested and it will likely require the presence of nesting birds to act as the lure needed to attract the predators. A single breach by a predator might cause ground colony abandonment for an entire season. Therefore, ensuring the exclosure is predator-proof will likely require a period of trial and error, possibly extending over multiple DCCO breeding seasons. An attempt to "educate" the foxes about the electrified fence using bait was attempted in 2011. It is not known if any fox-fence encounters occurred in 2011. This conditioning program should be attempted again in 2012.

In addition, attractants for DCCO such as decoys and the provision of nesting material should be deployed early in the breeding season to make the ground-colony appear as a viable alternative to tree-nesting sites.

1.5. Nesting and Roosting Deterrence

Experience has demonstrated that in many circumstances nest removal is not required if DCCO nests are prevented from becoming established in the first place. Nesting deterrence early in the nesting period discourages DCCO from using managed areas before they become firmly established, reducing nest removal effort overall. Similarly, DCCO appear to avoid roosting in areas where they detect human presence, so roosting deterrence may decrease the need for active roost disturbance.

Methods

Within the management areas two types of deterrents (scarecrows) were used to discourage DCCO nest establishment and roosting (**Appendix A**):

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[2] D. Poole and I. McKillop. 2002. Effectiveness of two types of electric fence for excluding the red fox (*Vulpes vulpes*). Mammal Review 32(1): 51-57.

- **Coverall-Style "Scarecrow"**
  - Used work-coveralls were positioned to look like a standing human, with a short pole through the arm openings. Nylon cable-ties secured the coverall cuffs to the pole to hold the arms out in an extended position (**Figure 8 – p. 15**).
  - Scarecrows were hung by a rope slung over a tree-limb so that the coverall legs would hang downwards mimicking the profile of a human, with the legs slightly above ground level so that they would move freely in the wind
  - Three of these scarecrows were set up on May 24; one in each of Upland Forest Groves A, C and D.
  - The effectiveness of the coverall-style scarecrows was judged by the degree of DCCO nesting and roosting activity around them.

- **Full-figure "Scarecrow"**
  - Life-sized, robotic mannequins that were originally intended to be used as a decorative, robotic "Santa Claus" (**Figure 9 – p. 15**) were modified to allow them to withstand outdoor conditions for extended periods of time, based on work done elsewhere. The original weak plastic legs were replaced with stronger PVC pipe and fittings and their plastic boots were filled with concrete to provide stability. The red suits were replaced with green plastic rain ponchos.
  - The robotic mannequins are triggered by motion, after which they dance and sing, reinforcing their human-likeness. A 12 volt car battery and step-down transformer was rigged to provide the appropriate power. The motion-sensor was also repositioned so that it would be more likely triggered by flying and landing birds
  - Two "Santas" were deployed on August 22 to assist with roost disturbance in 2011. One was set in the Shrub Thicket and the other on the northern edge of Bluff Thicket South. However, their motion and sound capabilities were not activated in 2011.
  - The effectiveness of the inactive full-figure scarecrows was judged by the degree of DCCO roosting activity around them

Results

- Of the three management areas containing coverall-style scarecrows, Upland Forest Groves A and D experienced no DCCO nesting attempts in 2011. DCCO did not nest in these areas in 2010, although they had in the past. Upland Forest Grove C had 15 DCCO nests built in the three trees adjacent to the coverall scarecrow. These 15 nests were built in late-May and removed from the trees on June 10. In 2010 there were 20 nests in this area.
- No DCCO were observed roosting in the trees adjacent to the full-figure scarecrows during the evening DCCO counts of August 25 and September 8 (**see section 1.4**). No guano was noticed on the full-figure scarecrows' extremities or rain ponchos suggesting that DCCO did not roost above them during their deployment.

Discussion

While coverall scarecrows are cheap and simple management tools for deterring nesting and roosting their effectiveness depends on many factors, including "attractiveness" of the site to DCCO, or existing presence of nests. It is worth deploying more coverall scarecrows in the future, but it is important to gather additional quantitative data to determine their effectiveness. As the 2011 nesting in Upland Forest Grove C illustrated, these scarecrows are ineffective when nesting pressure is high enough and/or once one or more DCCO has established a nest nearby, attracting more DCCO to the site.

The full-figure scarecrows are more expensive and labour intensive to modify and deploy but they do seem to offer some deterrence against roosting birds. The 'dancing and singing' feature was not employed in 2011 due to concerns with its reliability. Experience elsewhere suggests that DCCO can become desensitized to the full-figure scarecrows if they do not consistently activate.

Therefore, they were left turned off at this point and their presence alone seemed to provide the desired deterrence effect.

While scarecrows may be effective tools for discouraging DCCO nesting under certain circumstances, they will not work where large numbers of established nests are found. When removing nests in 2011 staff realized that without their ability to move and react to returning DCCOs that no degree of mechanical noise or movement would dissuade them. Scarecrows should only be used to augment other management techniques – on their own they will not deter persistent DCCO nesting.

1.6. Alternative Tree-nesting Habitat Enhancement

The objective of alternative tree-nesting habitat enhancement is to provide additional nesting opportunities for DCCO outside of the management areas, where there is no conflict with other values like heron nesting habitat. Within a few seasons trees used by nesting DCCO die and their branches break off. As a result, natural tree-nest sites become increasingly limited. In order to assess the possibility of providing more nesting opportunities within the unmanaged areas artificial nest platforms were built as described below.

Methods

- 15 artificial DCCO nesting platforms were erected in the northwest corner of Unmanaged Area East on July 13. The modified lath platforms were designed and erected based on a protocol used elsewhere[3]
- Three platforms were attached directly the trunks of 5 dead, mostly branchless ash trees, 5 to 6 meters above the ground (**Figure 10 – p. 15**).

Results

- The platforms were erected late during the 2011 DCCO nesting season and none were used by DCCO this year.
- Five of the platforms were knocked down by falling trees during a storm on July 18 but all were reinstalled on July 25.

Discussion

Past experience at Presqu'ile and elsewhere suggests that these types of platforms will be readily accepted by DCCO. The platforms remain in place year round and will be available to DCCO at the beginning of the 2012 breeding season.

The design will need to be modified in the future for a number of reasons, the chief one being the short life-span of limbless trees. These trees rot and fall within a few short years. This was clearly demonstrated during the July 18 microburst event when a tree supporting 3 artificial nest platforms was knocked down (**Appendix B**). In order to deploy large numbers of long-lasting (5 years or more) artificial tree-nest platforms the entire nesting structure must be artificial. At other locations nest platforms have been attached to telephone poles, but this approach is impractical for HBI. An alternate approach could be to make a modular design using scaffolding and affixing the platforms throughout the scaffolding. These scaffolding DCCO towers could be erected in areas away from sensitive woody vegetation and linked together. If constructed so they are wider than tall that they would not be blown over during strong wind events. These modular nesting platforms could be modified as required each year.

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[3] Meier, Thomas I.. Hine, Ruth L., Editor. Artificial nesting structures for the double-crested cormorant (Technical bulletin. (Wisconsin Dept. of Natural Resources), No. 126) Wisconsin Department of Natural Resources, 1981. 12 pgs. (http://digital.library.wisc.edu/1711.dl/EcoNatRes.DNRBull126)

Figure 3. A microburst event on July 18, 2011 knocked down almost 100 trees. This photo was taken at the edge of Unmanaged Area East, at vegetation monitoring plot 61-62. Several trees have been knocked down on the right side of the photo.

Figure 4. Several sections of a forestry pole are used to push a DCCO nest out of a tree.

Figure 5. Basswood trees are able to sucker when recovering from damage. This tree has several small saplings growing between its root flares.

Figure 6. The remaining willow tree on Sebastopol Point (Gull Island) was used by both BCNH and DCCO in 2011

Figure 7. A portion of the ground-nesting area was surrounded by electric fence in 2011 to deter terrestrial predators.

Figure 8. A coverall-style "scarecrow" used on HBI in 2011.

Figure 9. A full-figure "scarecrow" used on HBI in 2011.

Figure 10. Artificial nesting platforms attached to standing dead trees on HBI in 2011.

2. Heron Monitoring

Methods, results, and discussions are provided for each species individually and for heron roost monitoring in the following sections. General heron nest monitoring information is below:

- As in previous years, nesting attempts and establishment dates fluctuated throughout the breeding season for all species.
- Four measures of breeding activity and success are monitored and reported:
    - Maximum number of active nests – the largest number of individually identified nests known to be active during the breeding season (not all of these will produce young)
    - Number of successful nests – the number of nests that produced at least one chick that survived to fledging (i.e. leaving the nest)
    - Number of fledged young – the number of hatched birds that survived to the point of fledging
    - Number of fledged young per nest – a measure of nest productivity (only successful nests were used to calculate the number of fledged birds per nest)
- Failed heron nests generally fall into one of four categories (when cause can be determined):
    - Nest lost due to nest falling or tree falling
    - Nest abandonment in which case the nest is seen empty for one or more monitoring days before disappearing – these nests are generally disassembled soon after abandonment
    - Active nest disassembled – presumably by DCCO for nesting material
    - Nest taken over and nested in by DCCO (The original occupants are displaced by DCCO while they were likely using the nest. It is possible that the original occupants abandoned the nest for reasons unknown and DCCO immediately took over the nest but it has been observed that DCCO can forcibly displace the herons or egrets from their nests)

Table 7. Use of managed/unmanaged areas by tree-nesting colonial waterbirds in 2011. Tree numbers may not correspond with nest numbers because there were often several nests per tree.

Management area	DCCO 2011	Herons 2011
Basswood Grove	Y	*
Bluff Thicket North	Y	1 GREG tree 15 BCNH trees
Bluff Thicket South	Y	N
Red Ash Swamp Forest	Y	N
Ridge Forest North	Y	N
Ridge Forest South	N	N
Shingle Beach Thicket	Y	N
Shrub Thicket	Y	N
Upland Forest Grove A	N	N
Upland Forest Grove B	Y	5 GREG trees 10 BCNH trees
Upland Forest Grove C	Y	6 GREG trees
Upland Forest Grove D	N	N
Upland Forest Grove E	N	N
Upland Forest Grove F	N	N
Unmanaged Area - East	Y	14 GBHE trees
Unmanaged Area - West	Y	7 GREG trees
Sebastopol Point (Gull I.)	Y	1 BCNH tree

*There were several GREG nests on the edge of Basswood Grove in 2011

- Distribution of heron nests in the various management areas and DCCO zones is summarized in **Table 7** and shown in **Figure 2**. As in previous years, herons used areas that were already occupied by DCCO in 2011. The exception is the willow tree on Sebastopol Point, where BCNH nested first and the site was subsequently nested in by DCCO. The DCCO nests were removed.

2.1. Great Blue Heron Nest Monitoring

Methods

- Nests were initially located by surveying High Bluff Island with binoculars and spotting scopes on April 26. All nests were individually identified and tracked throughout the breeding season, including additional nests found after April 26.
- Observations were made using spotting scopes from one of 9 viewing stations to avoid disturbing the breeding birds. Viewing stations were >100 m from nests.
- Nests were monitored regularly throughout the breeding season 1-2 times per week between April 26 and July 26. During these monitoring events adult behaviour was observed to determine nesting status and the number of chicks seen in each nest was recorded.
- Since chicks within individual nests mature at slightly different times the maximum number of chicks seen at one time in the last month of nest occupancy was used as an estimate of the number of chicks fledged per nest.
- The UTM (Universal Transverse Mercator) coordinates for all successful nests were recorded at the end of the breeding season after chicks had left the nest.

Results

- The results of GBHE nest monitoring are provided in **Table 8**.
- The maximum number of active GBHE nests observed on HBI was slightly lower in 2011 than in 2010. More importantly, fewer GBHE pairs successfully raised young in 2011 than in all previous years, since detailed records were first kept in 2003. The number of chicks raised in 2011 was less than half of the 2010 total.

Table 8. Nesting activity and success of GBHE on High Bluff Island

Year	Maximum nest count	# successful nests	# fledged young	Mean # fledged per nest
2003	38	25	37	1.5
2004	63	38	75	2.0
2005	42	32	75	2.3
2006	36	22	51	2.3
2007	30	18	42	2.3
2008	26	23	46	2.0
2009	22	20	41	2.1
2010	29	28	66	2.4
2011	26	16	31	1.9

- The maximum number of active nests was observed from May 18 to 26 (i.e. in 2011 there were a total of 26 individual active GBHE nests observed during this period of time). This was similar to the peak nesting periods recorded in 2009 and 2010.
- Productivity decreased slightly in 2011.
- Of the maximum number of GBHE nests (26) and two nests rebuilt later, a total of 12 nests failed. All the failed nests were taken over by DCCO. DCCO were observed sitting in the nests and some were subsequently dismantled by DCCO. On May 18 this process was observed when a GBHE occupying its nest was seen fighting with DCCO and after a sustained

two minute conflict the GBHE fled its nest. Most nests were taken over during the incubation period, but 2 were taken over when they contained at least one medium-sized GBHE chick.
- 14 of the original 26 GBHE nesting trees were lost during the microburst event on July 18 (**Appendix B**). All GBHE chicks had fledged by this date.
- Most GBHE nested in ash trees in Unmanaged Area - East, with just two pairs nesting in the along the eastern edge of Basswood Grove in dead red oak and sugar maple trees. Both of these nests were taken over by DCCO in late May and early June.

Discussion

The general trend for the GBHE population on High Bluff Island has been downward since 2004. The most significant factor in this decline is loss of nesting trees. GBHE have always favoured the tops of the largest trees for nest sites; DCCO have as well. Typically the "preferred" trees can support both large numbers of DCCO and sometimes a few GBHE nests for a number of years, until the trees eventually die and become limbless or completely fall down. For GBHE the end result of this process is greatly reduced nesting opportunities. DCCO can be more flexible in their nest site selection and have moved into smaller trees, and can potentially move onto to the ground. DCCO have thus been able to maintain substantial nest numbers despite the loss of the majority of the most desirable nesting trees. Additionally, direct competition for nesting sites and materials occurs. Staff observed direct conflict between DCCO and GBHE again in 2011.

The decline in GBHE numbers at Presqu'ile will likely continue with the ongoing loss of the largest trees. The tree-loss process can become a feedback loop in which the loss of large trees creates a more open forest canopy through which strong winds can penetrate the formerly dense woodland. Under these conditions strong winds can wreak havoc. This was demonstrated during the July 18 microburst event that knocked down nearly half of the 2011 GBHE nest trees.

If GBHE move to new nesting areas on HBI, it may stimulate DCCO to follow, as DCCO are often attracted to other nesting birds. In this scenario, DCCO management may have to occur in close proximity to nesting GBHE in order to maintain large nesting trees on HBI in the future. Although this would be an undesirable scenario, the long-term value of maintaining large trees at these sites for biological diversity would justify the potential short-term disturbance to GBHE nesting.

2.2. Great Egret Nest Monitoring

Methods

- GREG nest monitoring occurred concurrently with GBHE nest monitoring, using the same methods.

Results

- The results of GREG nest monitoring are provided in **Table 9**.
- Both the maximum number of active GREG nests and the number of successful nests decreased in 2011. However, proportionally more nests were successful this year – the proportion of nests from the maximum nest count that successfully fledged young increased to 75% in 2011 from 68% in 2010. Nonetheless, these are low success rates compared to all previous years. In the past the success rate has been at least 85% most years.
- Productivity was slightly lower in 2011 but well within the normal range expected for this species.
- The maximum number of active nests was observed on June 1st, which is similar to the peak nesting periods observed in previous seasons
- Of the nests that failed 30% were documented to have been occupied by DCCOs and 70% "disappeared", presumably dismantled by DCCOs and possibly other GREGs looking for nesting material. The majority of the failed GREG nests contained incubating adults the last time that they were observed. The adults were likely driven off prior to the disappearance of their nest

Table 9. Nesting activity and success of GREG on High Bluff Island

Year	Maximum nest count	# successful nests	# fledged young	Mean # fledged per nest
2003	5	4	10	2.5
2004	10	10	26	2.6
2005	17	16	42	2.6
2006	16	14	35	2.5
2007	23	21	63	3.0
2008	27	23	62	2.7
2009	31	27	72	2.7
2010	41	28	72	2.6
2011	32	24	59	2.4

- All successful GREG nests were in and around the former western woodlot area: Basswood Grove, Bluff Thicket North, Upland Forest Grove B and C, as well as Unmanaged Area - West (**Figure 2 and 11**).
- GREG nests were located in chokecherry, basswood, hawthorn, ironwood and beech. The one nesting attempt in white cedar in Shrub Thicket failed.

Figure 11. GREG and DCCO nests in Upland Forest Grove C, 2011. Adult GREG and chicks can be seen standing on a nest in the dead tree between the two live trees on the left side of the photo.

Discussion

The GREG colony continues to be successful. It has increased steadily since 2003, and this was the first year that there was decrease in number of nests. Although the nesting success rate (ie: proportion of nests that were successful) was better this year than last, it is still relatively low, which may be due to competition with DCCO, or due to the maturity of the nesting GREG.

Throughout the period since GREG monitoring began in 2003, there have been occurrences of established GREG nests simply vanishing. Presumably this has been due to DCCO looking for nesting material. GREG nest loses have been observed to occur throughout the nesting season

from the early nest-initiation period until well into the chick-rearing period. Nonetheless, re-nesting has been common and successful chick-rearing has been observed in the majority of these late nests thus far.

Even though DCCO do not favour the lower nesting locations used by GREG, they will use them when more preferred habitat is limited. As the larger trees disappear, smaller trees and shrubs are becoming saturated with nesting DCCO. When this happens GREG/DCCO conflicts increase and, more importantly, the remaining woody vegetation is threatened by the effects of DCCO nesting. Fortunately, it is easy to remove DCCO nests from the low-lying vegetation that GREG prefer and experience has shown that GREG are particularly tolerant of human presence, while DCCO yield to management without much resistance. To prevent the loss of GREG habitat on HBI, ongoing management of these areas will continue to be a priority.

In 2011 some GREG nesting trees that also had DCCO within Bluff Thicket North and Upland Forest Grove B could not be managed since the DCCO nests found in those areas were near or possibly beyond the 75% incubation period at the time of initiation of DCCO management. In future years earlier initiation of management will prevent this from happening.

2.3. Black-crowned Night-heron Nest Monitoring

Methods

- BCNH nests are typically well-hidden within dense vegetation and thus these birds can not be monitored from a distance. BCNH adults are particularly sensitive to human disturbance during nest construction and egg incubation and the nestlings are prone to fleeing from nest sites if approached. Monitoring of BCNH nests is thus relatively limited compared to that of the other two heron species.
- Nests were initially located by briefly searching sub-canopy woody vegetation on HBI and the willow tree on Sebastopol Point early in the season, with opportunistic observations made throughout the season.
- Once BCHN had been observed frequenting patches of woody vegetation, one or two swift visits were made to the site so that nesting could be confirmed:
    - Sebastopol Point was searched on May 3 and July 5
    - High Bluff Island was searched on July 7
- Nest contents were viewed directly using a mirror attached to poles during these searches and all active BCNH nest trees were flagged.
- The UTM (Universal Transverse Mercator) coordinates for all successful nests were recorded at the end of the breeding season after chicks had left the nest.

Results

- The information provided in **Table 10** is based on compilations of data collected opportunistically over the breeding season, rather than on regular and continuous monitoring of individual nests.
- The maximum BCNH nest count has been increasing from its low point in 2009. The BCNH count on HBI was 47% higher than 2010 but still lower than most previous years. BCNH nesting in the willow on Sebastopol Point was the highest ever in 2011.
- Of the 25 nests counted on HBI on July 7:
    - 23 nests contained chicks and/or eggs
    - 2 nests did not have chicks or eggs but showed other signs suggesting activity (e.g. nest appeared to be newly-built, guano deposits around the nest, etc.)
    - The mean number of chicks/eggs per active nest was 2.8.
- Before management activities could begin in May 2011, the former BCNH nesting location on HBI, a small chokecherry grove in the Shrub Thicket used in 2010, was overwhelmed by DCCO. While some BCNH had been seen perching nearby on May 3 no BCNH nests were built. Subsequently in late May and June 122 DCCO nests were removed from these now

badly defoliated trees. All DCCO nests removed from this patch of vegetation were in the same trees used by BCNH in 2010. The high number of new BCNH nests later found in Upland Forest Grove B and Bluff Thicket North suggests that BCNH that previously nested in the Shrub Thicket may have nested here instead.
- BCNH nested in chokecherry, hawthorn, American beech, and basswood on HBI.

Table 10. Nesting activity of BCNH on High Bluff and Gull Islands (Sebastopol Point).

Year	Maximum nest count	# Active nests – Sebastopol Point	# Active nests – HBI
2003	80	26	54
2004	59	7	52
2005	71	14	57
2006	84	17	67
2007	77	0	77
2008	80	0	80
2009	46	19	27
2010	51	34	17
2011	61	36	25

- Of the 36 nests counted on Sebastopol Point on July 5:
  - 24 still contained young chicks and/or eggs
  - 12 nests did not have chicks or eggs but were well-built and had guano deposits around them. There were an additional 17 near-fledgling BCNH chicks on the island and they had likely come from these now empty nests.
  - The mean number of chicks/eggs per occupied nest was 2.5 (n = 24).
- The BCNH nests on Sebastopol Point are concentrated in the one remaining willow tree. DCCO did attempt to nest in this willow tree in June of 2011 but all 21 nests were successfully removed.

Discussion

Over the years BCNH nest numbers appear more volatile than the other two heron species. They vary both in overall number and in nesting location and density.
It appears that as formerly productive BCNH areas on HBI have been lost to DCCO, Sebastopol Point has become increasingly more crowded with BCNH. In 2009 a cedar grove found within the Bluff Thicket South that was heavily used by BCNH and GREG was occupied by DCCO and many of the trees have subsequently died (**see section 4.2**). In 2011 the Shrub Thicket was dominated by DCCO early in the season. These events resulted in a shuffling of BCNH sub-colonies (**Figure 12**).

Experience has shown that BCNH will readily move from a once-favoured nesting location to another site so long as those sites are available. BCNH at Presqu'ile utilize a variety of vegetation including the willow on Sebastopol Point, chokecherry thickets, white and red cedar trees and occasionally basswoods, ironwood and American beech. All of the BCNH nesting sites feature a patch of dense vegetation low to the ground and large enough to hide several nests. Most of the coniferous nesting opportunities for BCNH have been degraded already and this degraded conifer habitat will take many years to recover. However, chokecherry thickets sucker and grow rapidly. As a result they will likely become increasingly important to BCNH at Presqu'ile. Despite their ability to regenerate, chokecherry thickets are especially vulnerable to the effects of DCCO nesting because the larger individuals die quickly once DCCO nests are

established in them. Therefore, chokecherry thickets will be a priority for future DCCO management efforts to prevent the loss of existing and potential BCNH habitat.

Likewise, the willow on Sebastopol Point will also be a priority for protection. In 2011, DCCO attempted to nest there as they had in 2007. Both times branch and foliage loss and extensive "whitewashing" (guano deposition) were observed immediately. In both 2007 and 2011 nest removal efforts succeeded in clearing this tree of DCCO nests. The tree seems tolerant of the effects of BCNH nesting. BCNH have been present for 7 of the past 9 years and possibly much longer. To maintain this willow as BCNH habitat it will need to be watched very carefully for any sign of DCCO nesting. In 2011 a total of 21 nests were removed on two occasions. In 2007, many more nests were removed throughout the breeding season. While this willow tree is obviously an attractive site for DCCO, experience has shown that they can be managed here without displacing the BCNH.

Figure 12. DCCO nesting in Shrub Thicket on HBI in 2011. A BCNH is perched on a dead limb in the middle of the photo. BCNH were not able to nest in this area in 2011. Many of the chokecherries in this thicket have died or are covered in whitewash from nesting DCCO.

2.4. Heron Roost Monitoring

Roosting by heron species is monitored to determine if HBI is used as a regional roost for any of the 3 species, and to ensure that potential disturbance of roosting cormorants would not affect roosting herons.

Methods

- The number of GBHE, GREG, and BCNH coming in to roost on, or leaving to forage from, HBI was recorded at the same time as the DCCO roost monitoring (**section 2.2**): August 11 (pm), August 12 (am), August 16 (pm), August 17 (am), August 25 (pm), and September 8 (pm).
- During morning heron roost monitoring an observer sits on the tip of Owen Point on the park mainland and observes herons coming from and going to High Bluff Island from a half hour before sunrise until an hour after sunrise.

Results

- Only a handful of GBHE and GREG were observed arriving or departing from High Bluff Island during roost monitoring in 2011 (**Table 11**).

Table 11. Heron species observed arriving or departing HBI during the DCCO roosting monitoring in 2011.

	GBHE		GREG		BCNH	
Date	Arriving	Departing	Arriving	Departing	Arriving	Departing
August 11 (pm)						
August 12 (am)	2					
August 16 (pm)			3		1	2
August 17 (am)		18		3		
August 25 (pm)			1	3		
September 8 (pm)						

Discussion

Given the low number of herons observed moving between the mainland and HBI during roost monitoring, it is likely that they were local birds (individuals that had nested or were born on the island that year) and not individuals from elsewhere using the island as a regional roost. The local population of BCNH seems to forage in the marshes on the mainland (Presqu'ile and surrounding wetlands) as well as on HBI. They appear to be using the islands as both a roosting and foraging site but no large external population of BCNH seems to be visiting the island in the late summer.

3. Regional Trends in Tree-nesting Colonial Waterbirds

The following information comes from the annual meetings of the Great Lakes Area Working Group on Colonial Waterbirds, an informal binational group of scientists and wildlife managers who share information relevant to colonial waterbirds nesting on the lower Great Lakes and associated rivers in Canada and the United States.

3.1. DCCO

- Lake Ontario – Increasing steadily since 2006, with fluctuations within individual colonies due to a variety of reasons including sanctioned and unsanctioned management. 2006 was the low year at 20,692 nests and numbers have increased to 27,024 nests in 2011
- Lower Great Lakes area – Increasing steadily since 2006 (40,939 nests), with relatively stable numbers until 2010 (43,159 nests). Increased by 10% to 47,470 nests in 2011.
- Canadian Wildlife Service Decadal census (Lower Great Lakes area) – increased by 60% between Census 3 (1997 – 1999) and Census 4 (2007 – 2009)

3.2. GBHE

- Lake Ontario – Presqu'ile is only colony on the Lake Ontario shoreline (several colonies inland from the lake)
- Lower Great Lakes area – Few colonies were monitored in 2011 and information is not available
- Canadian Wildlife Service Decadal Census (Lower Great Lakes area) – More than quadrupled between Census 3 (1997 – 2001) and Census 4 (2007 – 2009)

3.3. GREG

- Lake Ontario – Presqu'ile remains the largest and most thoroughly monitored colony on Lake Ontario. There were 7 GREG nests observed at the only other colony on Lake Ontario in 2011 at Tommy Thompson Park.
- Lower Great Lakes area – There are 5 similar-sized or smaller colonies on the Niagara River and in Lake Erie.
- Canadian Wildlife Service Decadal Census (Lower Great Lakes area) – Almost tripled between Census 3 (1997 – 2001) and Census 4 (2007 – 2009), mainly due to increases at Presqu'ile and one of the Lake Erie colonies

3.4. BCNH

- Lake Ontario – Continued to decrease in 2011 due mainly to declines at largest Lake Ontario colony (Tommy Thompson Park) and the Hamilton Harbour sites. Presqu'ile was the 3rd largest colony on Lake Ontario in 2011.
- Lower Great Lakes area – Colonies are variable but in the monitored colonies declines in the number of nests outnumber increases.
- Canadian Wildlife Service Decadal Census – Decreased by 20% between Census 3 (1997 – 2001) and Census 4 (2007 – 2009), mainly due to a crash at TTP in 2008

4. Vegetation Monitoring

4.1. Methods

- Detailed methods for surveying the vegetation on High Bluff Island are described in a protocol (**Appendix C**). There are 23 permanent monitoring plots established in areas of woody vegetation across the island. These plots capture most of the management areas identified in the Islands Plan (**Figure 2**). Information collected within the plots includes tree condition, use of the plot by DCCO and herons, sapling tallies, and presence of ground and canopy cover.
- Surveys were timed to be as early as possible without disturbing breeding herons and egrets. Unfortunately, this means that nests of all species may have been disassembled or blown to the ground by the time the vegetation survey is done and therefore cannot be accurately counted during vegetation monitoring. However, tree tag numbers are recorded if they are encountered during the June and July cormorant nest counts.
- Survey dates have been:
    - August 31 to September 19, 2007
    - August 13 to September 5, 2008
    - September 9 to 30, 2009
    - August 26 to September 27, 2010
    - August 22 to September 14, 2011
- Information collected for plots may be incomplete each year for various reasons. Vegetation monitoring on High Bluff Island is hampered by the dense, tall growth of stinging nettle and thistles, and the fact that posts used to mark monitoring plots are often obscured by guano or knocked down and covered by falling trees and branches. Tags may disappear from live trees, perhaps due to bird activity or weather conditions. Trees die and fall quickly and downed trees become obscured by the nettle and thistle growth. Timing to complete this work is limited as it must occur after the breeding season but before seasonal changes in vegetation and before weather limits access to the island.
- Trends in tree health within plots are summarized. Regular statistics cannot be calculated for the data collected from this kind of monitoring work for many reasons. Each monitoring plot represents unique conditions (therefore, limited replication) and much of the information collected is qualitative/categorical. The plots were not selected randomly across the island – they were randomly located within representative patches of remaining woody habitat. The data collected is complex and affected by tree species, previous and current management, the dynamics of use by various waterbirds, and weather impacts (drought, wind).

4.2. Results

- All information reported below is for the 23 plots that were monitored in 2011 unless otherwise noted.
- Some trees within the monitoring plots could not be found, likely because they had died and subsequently fallen or lost their tags. Many of these trees were chokecherries in Ridge Forest South and Shrub Thicket

Vegetation Monitoring Plot Use by DCCO

- Distribution of vegetation monitoring plots and use by DCCO is presented in **Table 12**. There is no vegetation monitoring plot in Upland Forest Grove E. Only one vegetation monitoring plot, in Upland Forest Grove C, was newly colonized by DCCO in 2011.
- Two plots that had DCCO in 2011, in Ridge Forest North and Shrub Thicket, were cleared of DCCO early in the season and had no nests present during the nest counts or during vegetation monitoring.

Table 12. 2011 vegetation monitoring plot distribution and use by cormorants

Management area	# Veg Plots	# Veg Plots used by DCCO 2011	DCCO nests removed in 2011?
Basswood Grove	5	5	Y
Bluff Thicket North	2	0	N
Bluff Thicket South	2	1	Y
Red Ash Swamp Forest	1	1	N
Ridge Forest North	1	1	Y
Ridge Forest South	2	0	N
Shingle Beach Thicket	1	0	Y
Shrub Thicket	1	1	Y
Upland Forest Grove A	1	0	N
Upland Forest Grove B	1	0	N
Upland Forest Grove C	1	1	Y
Upland Forest Grove D	1	0	N
Upland Forest Grove E	0	N/A	N
Upland Forest Grove F	1	0	N
Unmanaged Area – East	1	1	N
Unmanaged Area – West	2	1	N
Total	23	12	

Tree use by DCCO in vegetation monitoring plots

- **Table 13** shows the use of live trees by DCCO within the plots that have been monitored every year since 2007, as a proportion of the trees that were alive in that year.
- The number of live trees in these 13 plots has declined by 43% since the plots were established in 2007. The proportion of live trees with DCCO nests in the plots increased steadily from 2008 to 2010. There were also more trees being colonized by DCCO throughout the breeding season – more trees were found with DCCO nests after the June nest count was completed each year.
- In 2011, management began in mid-May, prior to the June nest count. In the plots, there were fewer nests in live trees in the plots than in any other year. There were also fewer live trees being used by DCCO in the plots. DCCO use of live trees in the plots remained low throughout the breeding season, partially due to nest removal.

Table 13. Live tree use by DCCO in plots that have been monitored every year since 2007* (13 plots).

Year	# live trees present in plots	# DCCO nests in live trees (June count)	% live trees w/ DCCO June	% live trees with DCCO all season
2007	113	N/A	N/A	N/A
2008	105	59	9%	30%
2009	88	90	44%	46%
2010	74	75	46%	51%
2011	**64**	**40**	**20%**	**23%**

*This table also appeared in the 2010 report with slightly different numbers, possibly due to observer error. Each year some trees may be unaccounted for during monitoring, but may be found again in the following year.

- DCCO nested within the vegetation plots in live ash, basswood, and chokecherry trees and in dead ash, basswood, and ironwood trees in 2011. They did not nest in live cedar in the plots as they have in previous years. Most nests within the plots were in basswood trees.

Tree mortality in vegetation monitoring plots

- At least 9 out of 120 live trees (7%) that were monitored in 2010 were dead in 2011 (**Table 14**)
- It does not appear that any large live trees in the vegetation monitoring plots were lost during the July 18 microburst event. Most live trees that could not be accounted for in 2011 were chokecherries that were in new plots established in Ridge Forest North and South in 2010.

Table 14. 2011 vegetation monitoring plot tree mortality descriptions

# Trees died	Management Area	Species	Comments
1	Bluff Thicket South	white cedar	in cedar thicket regularly used by BCNH and GREG until DCCO colonization in 2008-2009
1	Unmanaged Area West	chokecherry	unknown cause of death
2	Basswood Grove	basswood	both in areas that have been used by DCCO consistently for several years
1	Bluff Thicket North	chokecherry	in chokecherry thicket that has been used by BCNH and GREG in past
2	Red Ash Swamp Forest	ash	in area used extensively by DCCO for several years, and was also used by GBHE for the first time in 2011
2	Ridge Forest South	chokecherry	in chokecherry thicket that has been used by BCNH and DCCO in the past, but not recently

Tree health in vegetation monitoring plots

- The 2010 monitoring report (Figures 5 and 6) illustrates the effects of DCCO nesting on tree health and structure.
- **Figure 13** shows the change in health for all live trees between 2010 and 2011 (e.g. healthy – unhealthy). It compares 3 groups of plots: those with no DCCO and therefore no management, those with DCCO that were managed in 2011, and those with DCCO that were not managed in 2011.

no DCCO – no mgmt	**DCCO - managed**	**DCCO – no mgmt**
Bluff Thicket North	Basswood Grove	Red Ash Swamp
Bluff Thicket South	Bluff Thicket South	Unmanaged Area East
Ridge Forest South	Ridge Forest North	Unmanaged Area West
Unmanaged Area West	Shrub Thicket	
Upland Forest Grove A	Upland Forest Grove C	
Upland Forest Grove B		

- Although the health assessment is subjective and complex, many general trends can be detected by examining the data. Trees in plots without DCCO were healthier than those in plots with DCCO. Many of the trees in the vegetation plots with DCCO were already dead in 2010
  - In the plots without DCCO (no DCCO – no mgmt):
    - Most of the trees in all plots were healthy and had no damage (category 0)
    - All trees that declined in health or died were damaged by wind or other falling trees, and/or were chokecherry trees
  - In the plots with DCCO that were managed in 2011 (DCCO – managed):
    - most of the healthy trees were in Ridge Forest North, Shrub Thicket, and Upland Forest Grove C
    - Many of the unhealthy trees (category 2) were chokecherries in Shrub Thicket
    - Most of the trees that got worse between the two years or were dying were basswoods, many of which were in Basswood Grove

- In the plots with DCCO that were not managed in 2011 (no DCCO – no mgmt):
  - The healthy trees were basswoods in Unmanaged Area West
  - The unhealthy and dead trees were ash in Unmanaged Area East and Red Ash Swamp Forest

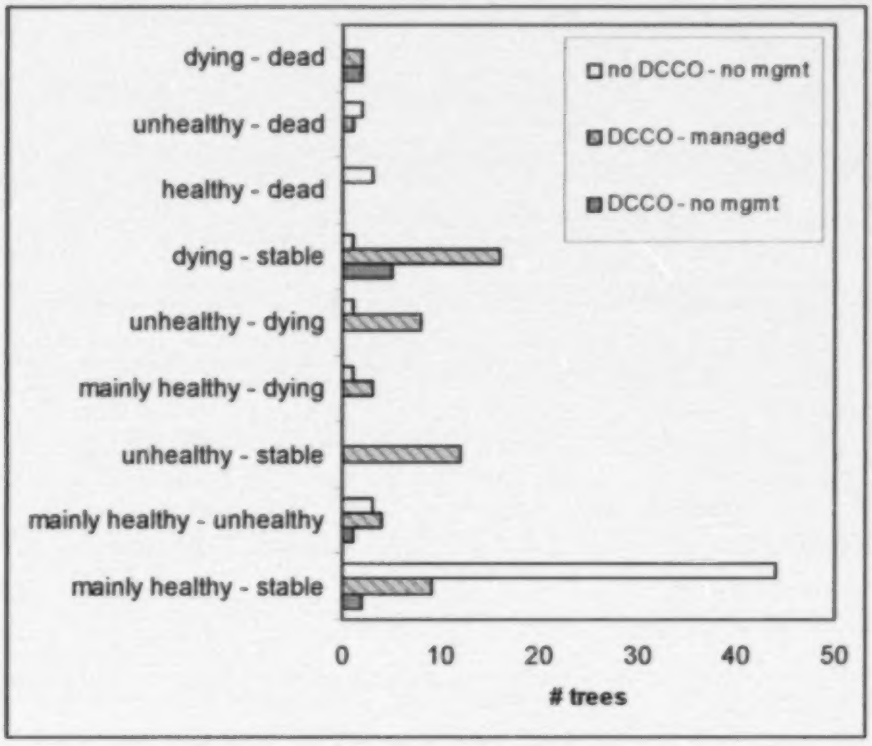


Figure 13. Change in health for all live trees in vegetation monitoring plots between 2010 and 2011 (e.g. mainly healthy – unhealthy). Health status is based on the vegetation monitoring protocol (**Appendix C**). Mainly healthy = category 0 or 1; unhealthy = category 2; dying = category 3 or 3+.

Vegetation Monitoring Plot Use by Herons

- Historically, the 3 heron species have nested throughout a variety of the management areas. A full overview of their nesting locations is shown in **Figure 2** and described in **section 3**. **Table 15** shows their use of the plots since 2007. In 2011 they used some new vegetation monitoring plots. While no GREG nested in Plot 57 (Bluff Thicket North) this year, they did nest close by within that management area.
- In 2011 fewer plots had herons nesting in them than in 2010. The Shrub Thicket plot has become unsuitable for nesting by BCNH due to the impacts of DCCO nesting last year – BCNH instead nested in a plot previously used by GREG, as well as in Bluff Thicket North and Sebastopol Point. GREG show some flexibility in their nesting locations from year to year.

Table 15. Plots that have been used by heron species 2007 - 2011 (plot ID in brackets)

Plot ID & Management Area	2007	2008	2009	2010	2011
57 – Bluff Thicket North	GREG	GREG	GREG	GREG	
12 – Bluff Thicket South	BCNH GREG DCCO	BCNH GREG DCCO	BCNH (failed) GREG (failed) DCCO	DCCO	DCCO
322 – Bluff Thicket South				GREG	
63 – Red Ash Swamp Forest		DCCO	DCCO	DCCO	GBHE
66 – Ridge Forest North	DCCO	DCCO	GREG DCCO	DCCO	DCCO
67 – Shrub Thicket	BCNH	BCNH	BCNH	BCNH DCCO	
321 – Upland Forest Grove B			GREG		BCNH
68 – Upland Forest Grove C	UNK	UNK	UNK	GREG	GREG DCCO
61-62 – Unmanaged Area East	DCCO	DCCO	GBHE DCCO	GBHE GREG DCCO	DCCO
25 – Unmanaged Area West	DCCO	DCCO		GREG DCCO	GREG DCCO

Other vegetation condition monitoring parameters

- Sapling data and ground and canopy cover were not analyzed in 2011. These data will be examined during the 5 year review of the Islands RMIP. Nonetheless, observation of the sapling data collected to date shows that there continues to be very few saplings in the vegetation monitoring plots, and most saplings are actually chokecherry trees.
- Deer browsing was noted on shrubs and saplings in 8 of the monitoring plots across the island in 2011, but was not quantified. Most of the browsing was noted in shrubby thickets.
- Tree health and structure was also quantified for **all** nest trees during the June and July nest counts. These data will be examined during the 5 year review of the Islands RMIP.

4.3. Vegetation Condition Monitoring – Discussion

DCCO have continued to move into new areas for nesting each year since 2007, and subsequently have affected tree health. Most of the plots that do not have nesting DCCO yet are in chokecherry/shrub thickets or isolated patches of large trees. These areas tend not to be preferred by DCCO, but may be used by GREG and BCNH. The plot in Upland Forest Grove A is near the base station, where human activity likely discourages DCCO nesting.

Although the number of live trees left in the plots continued to decrease in 2011, live tree use in the plots was half of what it was in 2010 and remained low throughout the breeding season, mainly due to cormorant management activities. Pressure on these remaining live trees will only increase as standing dead trees lose their limbs and eventually fall, becoming unsuitable for nesting. In 2011 cormorants did not use live cedar trees in the monitoring plots, likely because most of them have died and lost their limbs or fallen. This is particularly evident in the Bluff Thicket South plot (**Figure 14**), which is located in a cedar thicket that previously was heavily used by BCNH and GREG.

Tree mortality continues to be above what would typically be seen in a forest environment as trees succumb to the effects of cormorant nesting. Some of the tree "disappearance" and mortality is in chokecherry thickets and not directly due to DCCO nesting. Chokecherry thickets are naturally successional habitats – individual trees are not long-lived but sucker extensively. Larger individuals can also succumb rapidly to the effects of nesting waterbirds. Tree health is also clearly being affected by cormorant nesting activity. However, there are some trees

remaining in the plots used by cormorants that are mainly healthy or stable and that may recover with continued cormorant management, especially basswood.

The habitat of the heron species continues to overlap with that of the cormorants, as shown by the vegetation monitoring plots. So far 3 plots that once provided habitat to the heron species have been abandoned due to the impacts of cormorant nesting. Most of the plots that GREG and BCNH used in 2011 are within management areas. **(Figure 2, Table 15)**

Figure 14. DCCO nesting in dead cedar trees near plot 12 in Bluff Thicket South. These trees have died rapidly in the past few years due to DCCO nesting.

5. Other Wildlife

Opportunistic encounters by staff and one trail camera (Bushnell Trophy Cam 119436C) were used to detect the presence of mammals on HBI. The camera took digital photos of an area when triggered by movement.

5.1. Terrestrial predators

- The camera was set up and checked opportunistically from August 11 to Nov. 1. The viewing area, near the plantation, was baited with raw meat scraps
- 5 individual red fox (*Vulpes vulpes*) were observed on HBI throughout the season – one adult and four kits (**Figure 15, Appendix D**).
- In previous years Eastern Coyote (*Canis latrans*) had been seen on HBI but none were observed in 2011.
- All the kits seemed to suffer from severe mange-like affliction and were not very wary of humans. Staff often got quite close to resting or foraging kits. Carcasses of 2 of the kits were found in November.
- Fox scat was commonly found across the island. In early May it consisted primarily of meadow vole (*Microtus pennsylvanicus*) fur and bones. In early July the contents became more difficult to quantify but dead DCCO (and occasionally gulls) were consistently found across the island with their breast muscles and internal organs removed. This suggests that fox were feeding or scavenging on weaken DCCO adults and fledglings that had fallen from the nests – particularly after the microburst event on July 18.
- While the presence of red fox is believed to be negatively affecting HBI's colonial waterbird ground nesters, the foxes are a natural part of the ecosystem, arriving on their own and sustaining themselves without any human involvement (intentional or unintentional). Therefore, they are being treated as a legitimate component of the island's ecosystem and are left undisturbed. However, their future effect on ground nests might be mitigated by protection provided by the electric fence around a portion of the former ground-nesting colony area. Red fox are currently persisting on the island without access to a ground colony and it is believed that the protection of a limited patch of land to encourage ground-nesting will not affect the fox population.

- Adult, August 15 2011

- Kit A, August 29 2011

- Kit B, August 20 2011

- Kit C, August 26 2011

- Kit D, August 13 2011

Figure 15. Images of red fox captured by a trail camera on High Bluff Island in 2011.

5.2. White-Tailed Deer

- The camera was set up and checked opportunistically from August 20 to Nov. 1. The viewing area (an old apple tree near the plantation) was baited with apples.
- 3 deer were observed on HBI – one large doe, one small doe and one fawn (**Figure 16** and **Appendix D**).

Figure 16. Images of white-tailed deer captured by a trail camera on High Bluff Island in 2011.

- Extensive deer browsing was again noted on chokecherries in April. In mid-summer deer browsing was observed on the lower branches of larger oaks, elderberries and planted oaks.
- There continues to be little regeneration of woody species due to the effects of DCCO guano, which is currently greater than the effects of deer.
- Girdling by meadow voles is also having an impact on sumac and chokecherries than deer browsing, due to a very high meadow vole population observed in 2011.

5.3. Monarch butterfly

- Monarch butterfly (*Danaus plexippus* – special concern) monitoring continues to be limited by the ability to access the island in late summer and early fall. Monarchs migrate during specific weather conditions and staff may not be present on the island during the days with ideal migration or roosting conditions. Additionally, as monarch roosting congregations are ephemeral and movement across the island by observers is hampered by the dense and tall growth of stinging nettles and thistles, a limited amount of habitat can be monitored on any one day.
- To address this challenge, staff established a standardized 1.5 km transect in 2011 on which observers counted monarchs. The route covers a representative sample of the island's habitats and provides a quantifiable value for the number of butterflies using the island at any one time.
- While these monarch counts were being conducted on HBI similar surveys were done on the mainland along 1.5 km of the Owen Point Trail loop. Monarchs have congregated here in the past, including a massive roost of approximately 10,000 butterflies on September 15, 2010.
- The results from each count are presented in **Table 17**.

Table 17. Monarch butterflies (*Danaus plexippus*) observed while simultaneously walking a 1.5 km survey route on the Owen Point Trail and a set route on High Bluff Island, 2011

Date	Owen Point Trail	High Bluff Island	Notes from HBI
September 8	16	91	
September 12	46	83	
September 14	84	203	Most behind basswood trees in Bluff Thicket North
September 22	88	135	Most behind basswood trees in Bluff Thicket North and cedar grove in Bluff Thicket South
September 23	40	75	Most behind cedar grove in Bluff Thicket South
Total	274	587	

- HBI counts were routinely higher than the Owen Point Trail in 2011. Rather than using the field habitat, many of the individuals on HBI were sheltering in the lee of the island's woody vegetation (Bluff Thickets North and South). Presumably the butterflies were waiting for the strong lake breeze to subside before migrating farther south.
- While HBI provides excellent monarch feeding and egg-laying habitat due to the abundance of flowering plants and milkweed in the open field areas (**Figure 17**), it is likely that without its woody vegetation HBI would be a less suitable congregation location for migrating monarchs, since trees and shrubs provide shelter from the wind and monarchs often roost on woody vegetation.
- No large roosts of monarchs were observed anywhere at Presqu'ile in 2011.

Figure 17. Common milkweed is abundant in the open field areas on HBI.

5.4. Other wildlife noted on HBI in 2011

- HBI is a unique environment isolated from many terrestrial vertebrates. Of those that do make it to the island, few are able to persist on such a small landmass and in such a harsh environment. HBI has an enormous meadow vole population (no other small mammal species has been observed) and a population of eastern garter snakes (*Thanmnophis sirtalis*). A selection of noteworthy non-avian sightings from 2011are listed in **Table 18**.

Table 18. Opportunistic sightings of uncommon live vertebrates on High Bluff Island (excluding birds), 2011

Date	Species	Note
May 9	Red-bellied Snake	Two under board near plantation
August 26	Silver-haired Bat	Roosting on trunk of oak near base camp
September 7	Leopard Frog	Large adult female in field near centre of Island
September 8	Bull Frog	Shoreline near base camp.

- Sightings of bird species were made opportunistically throughout the monitoring season (**Appendix E**). Woody vegetation was heavily used by migrating passerines. The open field areas were also frequented by raptors during spring and autumn migration. Also, peregrine falcon (*Falco peregrinus* – threatened) and bald eagle (*Halieetus leucocephalus* – special concern) were occasionally seen hunting from trees during the post-breeding period. During the breeding season all of the habitats present on HBI were used by various bird species.
- Notably, the open field areas continued to support a breeding colony of bobolink (*Dolichonyx oryzivorus* - threatened):
    - In 2011 a quantitative survey of the colony was conducted on the mornings of June 13 and 20, using the OMNR bobolink survey protocol. The protocol involved establishing transects across the island's meadows punctuated with 5 observations/listening points (each 250m apart).
    - While flocks of 5 – 25 Bobolinks were observed migrating across the island in May, the 2011 nesting colony established itself in the centre of the island within 250m of 18T 279743E 4872744 (NAD83). The maximum number of birds was observed on June 20: 6 males and 3 females. Males were seen carrying food

and singing both while in flight and from multiple perches. Females were less conspicuous: each observation was a fleeting glimpse as they flew up and over to new regions of the meadow. There were likely more females than observed but the long grass, cryptic colouration and secretive behaviour help them elude detection during the two monitoring events.

- Large mixed-species flocks of swallows are regularly seen on HBI. These aggregations likely consist of resident birds augmented by large numbers of swallows from elsewhere. These aggregations, sometimes numbering into the thousands, occur anytime from May until August, particularly during cold and windy weather. The birds are generally seen flying in the lee of the large trees where they are presumably feeding on flying insects. On occasion they are also seen roosting in the branches of the same large trees.

6. Conclusion

2011 was the first year of implementation and management was not able to begin until after the breeding season had begun. Nonetheless, the management activities that were undertaken in 2011 successfully reduced cormorant activity in many management areas, which is expected to reduce the stress on the vegetation in those areas over the long term. There were fewer tree nests overall in 2011 than in 2010, and some management areas were kept relatively free of cormorant nests throughout the season. The later start had three main consequences:

(1) some cormorant nests were already past the 75% incubation date and could not be managed;

(2) some cormorants that were earlier in their incubation period had already invested enough in a particular area to be persistent in nesting attempts in that area and reluctant to move to alternate locations;

(3) cormorants colonized nesting areas traditionally used by heron species before the herons were able to get established.

Experience has shown that relatively benign techniques, involving an escalating scale of deterrents, can effectively prevent DCCO from using management areas if initiated early in the breeding season. In future years management will need to be initiated as early in the breeding season as possible.

There were no successful ground nests again in 2011. Management activities were initiated in 2011 to encourage future ground-nesting. As the standing trees within the unmanaged areas die and fall, encouraging DCCO ground-nesting will become an increasing priority. The displaced birds will require viable alternative nesting opportunities or they will move into the protected habitat of the management areas, with predictable results. While cormorant roosting was not on a large scale, limited roost disturbance and deterrence appeared to successfully prevent roosting in trees in the management areas.

All three heron species continued to nest successfully on the Presqu'ile Islands, although they are shifting their habitat use, in some cases due to the decline of their traditional habitats. Nesting by GBHE is continuing to decline, likely due to habitat loss. GREG nesting decreased slightly, which may be due to natural variability or to competition with DCCO. BCNH nesting increased this year, with a high concentration of nests in the willow tree on Sebastopol Point. Competition for nesting sites and materials is occurring between DCCO and the 3 heron species. Since DCCO prefer to nest in the tops of large trees, conflicts with GBHE tend to result in nest "takeovers" by DCCO. Conflicts with GREG have involved DCCO taking nesting material, since GREG nest in lower vegetation that is not preferred by DCCO. BCNH also use lower vegetation, and their nesting material generally is not used by DCCO. However, they are sensitive to DCCO nesting above them and killing the small live branches that they rely on for cover. With that habitat becoming limited on the island there is an increasing potential for direct competition for nesting sites, highlighting the importance of careful implementation of management actions based on nesting behaviour and colony dynamics.

Regional trends suggest that management at Presqu'ile in 2011 did not have an impact on the larger DCCO population of Lake Ontario or the province. Nesting colonies on Lake Ontario remain limited for the 3 heron species, and BCNH is declining in other colonies, highlighting the importance of maintaining habitat for these species at Presqu'ile.

Vegetation continued to succumb to the effects of DCCO nesting, which is impacting areas used by herons for nesting. Despite the successful management activities in 2011, the availability of tree-nesting habitat continued to decrease in 2011 due to: (1) the ongoing collapse of existing nest trees; (2) lack of natural regeneration; (3) extreme weather events.

- Collapse of existing nesting trees:
  - Large trees were preferentially used for nesting when DCCO first colonized the wooded areas of High Bluff Island. Now, many of these "preferred" large trees have died and fallen to the ground. As the larger trees disappear from the landscape, DCCO are moving into smaller trees, including chokecherry thickets. Exposed to lethal quantities of guano these smaller trees are also deteriorating, dying, rotting and losing limbs. They are quickly becoming branchless poles that can no longer provide nesting locations for their current occupants, let alone provide unoccupied nesting locations for new and displaced DCCO. This may be why the average number of nests per tree has not increased in the unmanaged areas.
- Lack of regeneration:
  - Within both unmanaged areas most existing woody vegetation is already occupied by DCCO nests and as of yet no new trees are growing up to replace those large nest trees that have fallen. This lack of natural regeneration is a consequence of high deer browse pressure in the late 80s and 90s. Deer browsing was subsequently compounded by lethal doses of guano deposition starting in the late 90s up to current day. These two pressures have halted forest regeneration for the last two decades in both unmanaged areas, as well as in much of the managed areas. Therefore, each year there are fewer trees to nest in on HBI, increasing the pressure on existing vegetation or causing DCCO to move elsewhere.
- Extreme weather events:
  - Each year there are large windstorms that hit the island through all four seasons. The microburst event in July knocked down 95 large live and dead trees, most of which were being used by DCCO and GBHE. This event obviously reduced the amount of nesting habitat available, and the effects of it will last decades.

The protection and restoration of woody vegetation should remain a priority. Remaining live chokecherry groves and basswoods will likely recover as long as cormorants are prevented from nesting and roosting in them. Tree species that mature more slowly, like maple, oak, and ash, will take much longer to restore and will not be present to the same extent that they were prior to cormorant nesting in the next several decades. Tree-planting and the maintenance of existing plantations will enhance the regeneration of hardwoods, but preventing further loss of existing mature hardwood trees is critical. These large trees provide a structural element to the island and are the seed-source that will allow future regeneration of hardwood trees on HBI.

A variety of other wildlife species continued to use the various habitats present on both islands for reproduction, feeding, and migration.

The implementation of management has come at a critical point for the Presqu'ile islands. The cumulative effects of tree-nesting DCCO are threatening the health and extent of the remaining woody vegetation on the islands. Woody vegetation health and extent have been declining since previous management ceased in 2007. Without management, this vegetation will become degraded to the point that it can no longer provide habitat for the other colonial waterbirds that also use the islands. Other natural values requiring woody vegetation (migrating birds, roosting swallows, monarch butterflies etc.) will also be negatively affected.

Management Area	Monitoring initiated	DCCO nesting	DCCO nests first noted	Management initiated/ Type(s) conducted	# DCCO nests removed	DCCO nests (June)	DCCO nests (July)	GREG nesting	GBHE nesting	BCNH nesting	Notes
Basswood Grove	April 7	Y	May 9	May 30 - Nest removal	370	598	359	*	N	N	Nest removal was focused in priority areas within the Basswood Grove. DCCO nests in dead vegetation far from living vegetation were not removed due to time constraints. The July nest count includes nests that were rebuilt after nest removal stopped. There were several GREG nests on the edge of this area.
Bluff Thicket North	April 7	Y	April 26	Aug 11 - Roost disturbance	0	38	0	1	N	15	DCCO nests too developed to proceed with management. These nests fell during the July microburst event.
Bluff Thicket South	April 7	Y	April 26	May 5 - Nest removal Aug 11 - Roost disturbance Aug 22 - Scarecrow	125	35	0	N	N	N	Nest removal successfully cleared this Managment Area of DCCO. Full-figure scarecrow installed in August to prevent roosting
Red Ash Swamp	April 7	Y	April 7	No mgmt.	0	664	342	N	N	N	DCCO nests too developed to proceed with management. The July nest count decline reflects the normal seasonal decline in nests and the effects of the July microburst.

Management Area	Monitoring initiated	DCCO nesting	DCCO nests first noted	Management initiated/ Type(s) conducted	# DCCO nests removed	DCCO nests (June)	DCCO nests (July)	GREG nesting	GBHE nesting	BCNH nesting	Notes
Ridge Forest North	April 7	Y	May 5	May 25 - Nest removal	437	121	11	N	N	N	Concentrated nest removal here to protect the remaining mature hardwood trees. Its proximity to Unmanaged Area East likely made it attractive to "overflow" DCCO.
Sebastopol Point (Gull Is.)	April 7	Y	June 11	June 17 - Nest removal	21	0	0	N	N	36	DCCO nests removed twice. During both DCCO nest removal events adult BCNH observed roosting on western end of Sebastopol Point or flying. BCNH were observed returning to nests immediately after staff departed Sebastopol Point.
Shingle Beach Thicket North	April 7	Y	June 6	June 15 - Nest removal	1	0	0	N	N	N	Only a single DCCO nest constructed at this site - it was removed.
Shingle Beach Thicket South	April 7	Y	June 6	June 15 - Nest removal	30	6	0	N	N	N	Management successfully excluded DCCO
Shrub Thicket	April 7	Y	May 9	May 18 - Nest removal Aug 11 - Roost disturbance Aug 22 - Scarecrow	122	0	0	N	N	N	Concentrated nest removal here to protect chokecherries, which BCNH have nested in traditionally. Its proximity to Unmanaged Area East likely made it attractive to "overflow" DCCO Full-figure scarecrow installed in August to prevent roosting

Management Area	Monitoring initiated	DCCO nesting	DCCO nests first noted	Management initiated/ Type(s) conducted	# DCCO nests removed	DCCO nests (June)	DCCO nests (July)	GREG nesting	GBHE nesting	BCNH nesting	Notes
Upland Forest Grove A	April 7	N	none noted	May 24 - Scarecrow Aug 11 - Roost Disturbance	0	0	0	N	N	N	No DCCO nesting activity in 2011. No herons present in this management area.
Upland Forest Grove B	April 7	Y	May 9	No mgmt.	0	2	0	5	N	10	DCCO nests too developed to proceed with management.
Upland Forest Grove C	April 7	Y	May 27	May 24 - Scarecrow June 10 - Nest removal	15	89	30	10	N	N	Only 15 nests removed in an outlying tree within this Management Area. The remaining DCCO nests in this area were too developed to proceed with management by the time that staff resources were available to manage this site. The GREG nesting in this Management Area did not leave their nests while management was conducted. The trees in which nest removal occured were approximately 70 m. from GREG nest trees.
Upland Forest Grove D	April 7	N	none noted	May 24 - Scarecrow	0	0	0	N	N	N	No DCCO nesting activity in 2011.
Upland Forest Grove E	April 7	N	none noted	No mgmt.	0	0	0	N	N	N	No DCCO nesting activity in 2011.
Upland Forest Grove F	April 7	N	none noted	No mgmt.	0	0	0	N	N	N	No DCCO nesting activity in 2011.

LOCATION	SPECIES	LIVE/DEAD	DCCO TREE	OTHER SPECIES
Basswood Grove	Red Oak	D	Y	
Bluff Thicket North	Red Oak	L	Y	
Bluff Thicket North	Red Oak	D	Y	
Bluff Thicket North	Red Oak	D	Y	
Bluff Thicket North	Red Oak	D	Y	
Bluff Thicket North	White Cedar	L	Y	BCNH
Bluff Thicket North	White Cedar	L	Y	BCNH
Bluff Thicket North	White Cedar	L	Y	BCNH
Bluff Thicket North	White Cedar	L	Y	BCNH
Bluff Thicket North	White Cedar	L	Y	BCNH
Bluff Thicket North	White Cedar	L	Y	
Unmanaged Area East	Red Ash	L	Y	GBHE 2010
Unmanaged Area East	Red Ash	L	Y	GBHE 2010
Unmanaged Area East	Red Ash	L	Y	GBHE 2010
Unmanaged Area East	Red Ash	L	Y	GBHE 2010, 2011
Unmanaged Area East	Red Ash	L	Y	GBHE 2010, 2011
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	L	Y	
Unmanaged Area East	Red Ash	D	Y	GBHE 2011
Unmanaged Area East	Red Ash	D	Y	GBHE 2011
Unmanaged Area East	Red Ash	D	Y	GBHE 2011
Unmanaged Area East	Red Ash	D	Y	GBHE 2011
Unmanaged Area East	Red Ash	D	Y	PLATFORM TREE (3)
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	

LOCATION	SPECIES	LIVE/DEAD	DCCO TREE	OTHER SPECIES
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	Y	
Unmanaged Area East	Red Ash	D	N	
Unmanaged Area East	Red Ash	D	N	
Unmanaged Area East	Red Oak	D	Y	
Unmanaged Area West	Basswood	L	N	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	Red Oak	D	Y	
Unmanaged Area West	White Cedar	D	Y	

High Bluff Island
Vegetation Monitoring for Resource Management

prepared by Corina Brdar, Zone Ecologist and Don Tyerman, Biodiversity Specialist
updated April 2011

Introduction

Vegetation monitoring on High Bluff Island will be used to assess the outcomes of several resource management actions on the island and on the park mainland. The findings of this monitoring may be used to inform future management decisions. The following are possible desired outcomes for resource management on the island. They may serve as hypotheses for the purposes of monitoring and statistical analyses.

Deer
1a) measurable increase in the number of stems of native trees and shrubs
1b) survival of young trees to sapling size
1c) prevention of excessive browse damage to shrubs

Cormorants
2a) maintenance of nesting habitat for great egrets and black-crowned night-herons, and roosting habitat for monarch butterflies
2b) no loss of specific woody habitat areas, including the remaining willow tree on Gull Island

Restoration
3a) restoration of existing specific woody habitat areas
3b) improvement of woody habitat in previously wooded areas (prior to 1982) on High Bluff Island

Conditions on High Bluff Island are unique. Vegetation monitoring is hampered by the dense, tall growth of stinging nettle and thistles, and the fact that posts used to mark monitoring plots are often obscured by guano or knocked down and covered by falling trees and branches. Metal tree tags have disappeared from live trees. It is possible that they are attractive to cormorants and have been removed. Trees die and fall quickly and may lose their tree tags when they fall or land in a way where the tag is not visible. Timing to complete this work is limited as it must occur after the breeding season but before seasonal changes in vegetation and before weather limits accessibility of the island. Surveys must be timed to be as early as possible in the growing season without disturbing breeding herons and egrets.

Several methods for monitoring the impacts of cormorants on vegetation have already been used for High Bluff Island and other protected sites. Ideally the same monitoring methods would be used at all sites, year after year. However, a review of the results of monitoring on HBI from 2000 – 2006 determined that methods used in the past needed improvement. They could not provide enough quality, consistent data to be useful in an adaptive management approach. Aspects of this new monitoring strategy are similar to the monitoring used previously and elsewhere, and the overall findings will be broadly comparable.

This method was tested in August of 2007 and an initial set of plots were surveyed between late August and late September in 2007. Photomonitoring was initiated in August of 2008. Measures of tree condition used from 2007 to 2009 were difficult to assess consistently and did not accurately reflect the patterns of tree decline on High Bluff Island. Therefore, this monitoring protocol was updated in 2010 with new tree health parameters.

Sampling Design and Methods

- Sampling plots have been established across the island in as many treed areas as possible. Some plots were initially established in areas where all trees have died to track natural regeneration, but these plots have been abandoned due to the difficulty of maintaining the plot marker.
- Some of the sampling plots overlap with trees from previous monitoring programs.

- UTM coordinates of centerpoints have been recorded with a Garmin Map76 CSX (300 pt. averaging), and marked permanently with a 2 m wooden stake or T-bar

Timing

- There is a narrow window of opportunity when the complete vegetation monitoring can take place, between the time that herons and egrets have completed rearing young and the onset of fall. By mid to late September many trees will start losing leaves either due to drought or fall winds, and weather may make access to the island difficult.
- Plots are surveyed between late August and late September.
- Tree condition variables (tree health and structure) are also estimated for all trees during the June cormorant nest counts if possible.

Plot Establishment

- establish center point and plot edge 5 m from center (10 m diameter circular plot)
- divide plot into 4 quadrants using two 10m ropes
- assess and mark with metal tree tags all trees and saplings within 5 m radius of center point

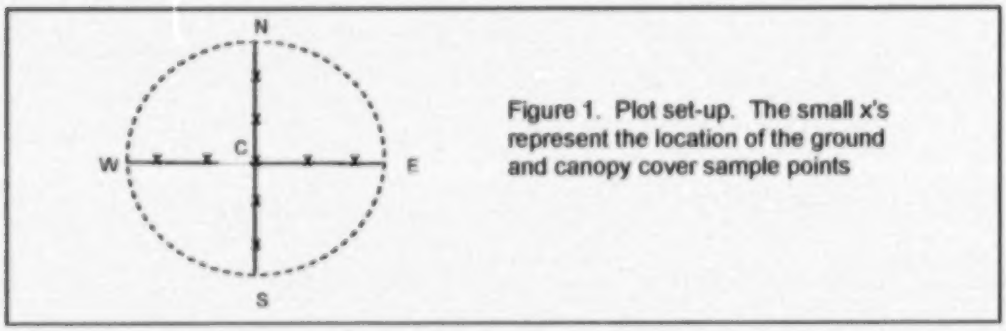


Figure 1. Plot set-up. The small x's represent the location of the ground and canopy cover sample points

Tree Measurements

- assessments described below will be done on tree species >7.5 cm dbh (diameter at breast height)
- woody stems of tree species < 7.5 cm dbh and shrub species are difficult to mark and will be assessed separately
- trees that split below breast height should be treated as 2 or more individuals

Tree damage from guano and nesting activities is unlike other types of damage and also differs among tree species, so the following variables were developed to represent the condition of the trees on High Bluff Island. The following variables will be measured for each **live tree**:

- species – use 8-letter species code
- height – assign to height class category
  - A = < 0.5 m
  - B = > 0.5 – 2 m
  - C = > 2 – 10 m
  - D = > 10 – 25 m
  - E = > 25 m
- dbh – at 1.3 m to assign to size class category
- health – based on current **live** area of the tree **only**
  - 0 – healthy, little or no apparent leaf loss or crown dieback
  - 1 – some foliage loss (roughly < 25%)
  - 2 – moderate foliage loss (roughly 25 – 75%)
  - 3 – most foliage lost (> 75%)
  - 3+ – tree will very likely die in following year (very little foliage left)
- structure – based on **whole** tree. Can be more than one category

  - N = normal (do not choose another category if this one is chosen)
  - C = clumping of foliage
  - E = epicormic branching from trunk
  - TD = top dead
  - S = suckering from base (only if tree appears to be unhealthy, not if normal growth pattern for that species)
- presence/absence of nests and whitewash – both DCCO and other colonial species

The following variables will be measured for each **dead tree**
- estimated dbh – if tag has gone missing to help identify tree
- presence/absence of nests and whitewash – both DCCO and other colonial species

Sapling measurements
- to be done on young individuals of tree species (<7.5 cm dbh, but > 50 cm height)
- includes larger individuals of Chokecherry (*Prunus virginiana*) when stems countable (dbh > 2 cm)
- tally numbers
- note deer browse or rodent damage
- where chokecherry saplings/seedlings are too numerous to count a sub-sampling protocol should be implemented in which the number (live and dead), average height and three tallest heights will be measured within 1m x 1m quadrats at 9 locations (1 at center point and 2 per quadrant, 1.5 m apart-see diagram) within the plot

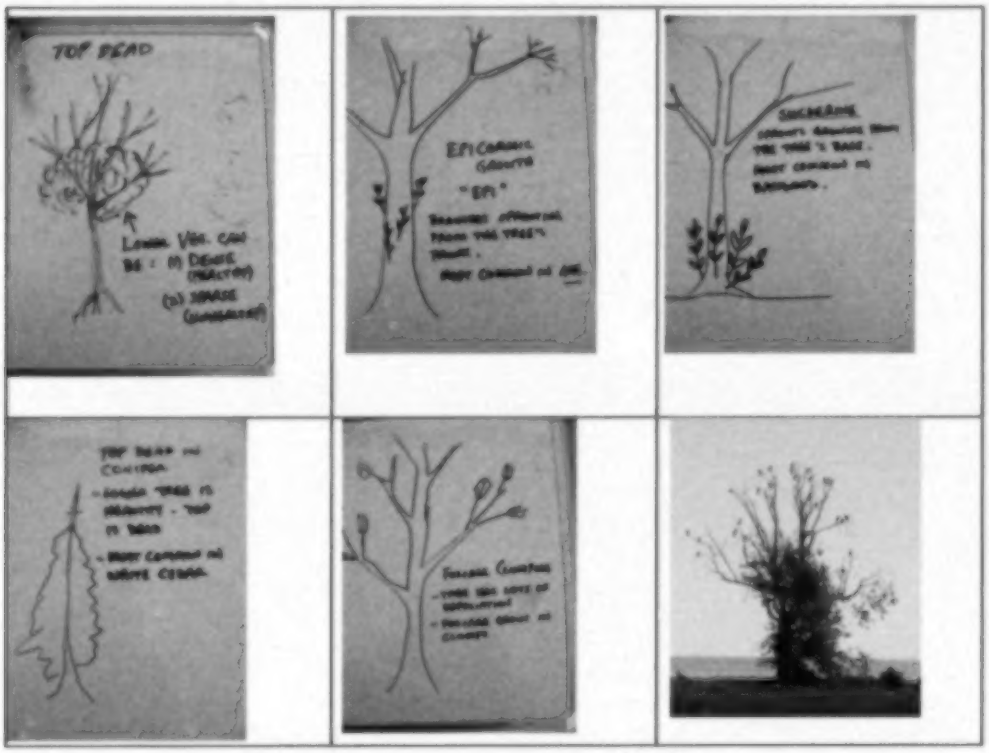
Plot Measurements
- 9 cover estimates (presence/absence if looking straight up through a toilet paper tube) for ground and canopy (per West Sister Island methods) – 1 at center point and 2 per quadrant, 1.5 m apart (i.e. – along transects – see diagram)
- presence/absence of nests within plot – all nests hanging over the perimeter of the plot, regardless of origin of tree they are in
- one photo with photo board in each direction from center, with plot number and date clearly visible in photo
- soil samples may be taken at plot center in future

Restoration Monitoring – to be determined
- survival of planted trees and seeds

Equipment Needed – Do Not Go In the Field Without!
Set-up
- GPS with point averaging capabilities
- compass, 100 m transect tape
- stakes and fluorescent paint, mallet, and Sharpie marker
- numbered metal tree tags & nails

Monitoring
- GPS
- datasheets and pencils
- binoculars
- camera, photomonitoring board, whiteboard, and dry-erase marker
- 4 x 5-m ropes (or 2 x 10)
- dbh estimator (callipers or tape)
- cover estimate tube (toilet paper roll works)
- extra tree tags, nails, paint, and stakes
- map and list of plot locations and descriptions
- species list
- field guides

Tree structure diagrams. The tree in the bottom right corner is top-dead, with some clumping of the foliage in the lower right branches and some epicormic growth on the trunk.



Example photomonitoring pictures. The picture should be taken from the center post of the plot and capture as much of the quadrant as possible. The plot number, direction, and date including year should be written clearly on the whiteboard so that it can be read if zoomed in.

Sightings of red fox (*Vulpes vulpes*) on High Bluff Island, 2011

Date	Observations
April 25	Healthy adult fox on edge of west woodlot
May 9	Adult running through attempted RBGU ground colony on HBI
May 18	Digging site found in Ridge Forest South, south of the plantation
June 8	3 Kits spotted in eastern woodlot area
June 11	Kit foraging in field in centre of island
June 12	Healthy adult seen near shingle beach
July 13	Kit resting near eastern shore landing site
July 14	Kit foraging near shrub thicket
July 19	Kit on path leading to protected DCCO ground colony area
August 10	Kit running towards sumac grove on shingle beach
August 13	Kits A & C at predator bait site (camera)
August 14	Kit C at predator bait site (camera)
August 15	Kits B, C and 1 Adult at predator bait site (camera)
August 15	2 Kits with mange both seen separately near plantation
August 16	Kit C seen at predator bait site (camera)
August 19	Kit B seen at predator bait site (camera)
August 20	Kit B at predator bait site (camera)
August 21	Kit C at predator bait site (camera)
August 22	Kit B at predator bait site (camera)
August 22	Kit on trail running towards the northern shore
August 24	Kit C seen at predator bait site (camera)
August 24	Kit A seen at apple tree (deer) bait site (camera)
August 26	Kit B seen at predator bait site (camera)
August 27	Kit D seen at predator bait site (camera)
August 28	Kit D seen at predator bait site (camera)
August 29	Kit C seen at predator bait site (camera)
August 30	Kits B & C seen at predator bait site (camera)
August 31	Kit B seen at predator bait site (camera)
September 3	Kit B seen at predator bait site (camera)
September 6	Kit B seen at predator bait site (camera)
November 1	Kit carcass found just north of Upland Forest Grove C
November 25	Kit carcass found on the eastern shoreline of HBI

Sightings of White-tailed Deer (*Odocoileus virginianus*) High Bluff Island, 2011.

Date	Observation
May 3	2 does near basecamp – one doe larger the other
May 26	Doe at western end of west DCCO zone
June 12	2 does (one larger than the other) watching fox near shingle beach
August 20	Fawn and 2 does at the apple tree bait site (camera)
August 21	Possibly 2 does at apple tree bait site (camera)
August 24	Doe at apple tree bait site (camera)
August 26	Doe at apple tree bait site (camera)
August 30	Fawn + doe at apple tree bait site (camera)
September 3	Fawn at apple tree bait site (camera)
September 4	Fawn at apple tree bait site (camera)
September 6	Doe at apple tree bait site (camera)
November 1	Extensive deer browse noticed on much of the island's elderberry.
November 25	2 does and one fawn seen near basecamp.

Note: This is not an exhaustive list of species presence. Species at risk are in **bold**.

FAMILY	Species	07-Apr-11	26-Apr-11	03-May-11	08-May-11	09-May-11	12-May-11	18-May-11	26-May-11	29-May-11	01-Jun-11	03-Jun-11	06-Jun-11	08-Jun-11	10-Jun-11	11-Jun-11	12-Jun-11	21-Jun-11	23-Jun-11	24-Jun-11	30-Jun-11	05-Jul-11	07-Jul-11	12-Jul-11	13-Jul-11	26-Jul-11	04-Aug-11	19-Aug-11	08-Sep-11	09-Sep-11	14-Sep-11	23-Sep-11	18-Oct-11	01-Nov-11
LOONS	COLO					Y	Y		Y																					Y			
CORMORANTS	DCCO	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
HERONS	GBHE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	GREG		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	BCNH		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
IBISES	WFIB																								Y	Y							
WATERFOWL	MUSW		Y			Y	Y		Y										Y		Y	Y								Y	Y	Y	Y
	CAGO	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y										
	GWTE																							Y							Y		
	ABDU						Y	Y							Y	Y	Y														Y		Y
	MALL	Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y							Y	Y		
	AMWI			Y																			Y										
	GADW		Y	Y			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y				Y	Y									
	REDH																																
	RNDU	Y																															
	COGO																																
	LTDU	Y	Y							Y		Y																					Y
	BUFF	Y	Y	Y																													Y
	COME			Y																													
	RBME	Y	Y				Y		Y	Y				Y																			
	WWSC																																Y
	RNGR																																Y
BUTEOS	OSPR		Y																														

FAMILY	Species	07-Apr-11	26-Apr-11	03-May-11	05-May-11	09-May-11	12-May-11	18-May-11	26-May-11	29-May-11	01-Jun-11	03-Jun-11	06-Jun-11	08-Jun-11	10-Jun-11	11-Jun-11	12-Jun-11	21-Jun-11	23-Jun-11	24-Jun-11	30-Jun-11	05-Jul-11	07-Jul-11	12-Jul-11	13-Jul-11	26-Jul-11	04-Aug-11	19-Aug-11	08-Sep-11	09-Sep-11	14-Sep-11	23-Sep-11	18-Oct-11	01-Nov-11
	BAEA																							Y								
	RLHA																																
HARRIERS	NOHA	Y																										Y		Y	Y		
FALCONS	**PEFA**						Y																	Y									Y
	MERL					Y																											
PLOVERS	BBPL																											Y				Y	Y
	SPPL																																
	KILL	Y													Y	Y				Y												Y	
SANDPIPERS	GRYE																										Y					Y	
	SPSA													Y									Y	Y				Y					
	RUTU										Y																		Y			Y	
	SAND																											Y	Y			Y	
	LESA																											Y	Y			Y	
	DUNL																															Y	
GULLS+ TERNS	BOGU																						Y									Y	
	RBGU	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	HEGU	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	CATE		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y					
	COTE			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						
DOVES	MODO	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y			Y	Y						Y	Y		
KINGFISHERS	BEKI																											Y					

FAMILY	Species	07-Apr-11	26-Apr-11	03-May-11	05-May-11	09-May-11	12-May-11	18-May-11	26-May-11	29-May-11	01-Jun-11	03-Jun-11	06-Jun-11	08-Jun-11	10-Jun-11	11-Jun-11	12-Jun-11	21-Jun-11	23-Jun-11	24-Jun-11	30-Jun-11	05-Jul-11	07-Jul-11	12-Jul-11	13-Jul-11	26-Jul-11	04-Aug-11	19-Aug-11	08-Sep-11	09-Sep-11	14-Sep-11	23-Sep-11	18-Oct-11	01-Nov-11
WOODPECKERS	YBSA		Y																												Y		
	NOFL		Y	Y	Y															Y										Y	Y		
FLYCATCHERS	EAPH	Y	Y	Y					Y																								
	EAKI		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y		Y		Y				Y					
	YBFL								Y																								
	EAPE								Y																								
	LEFL						Y		Y																								
	GCFL															Y																	
	ALFL												Y	Y	Y	Y	Y																
SWALLOWS	TRSW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y									
	BANS			Y	Y	Y	Y	Y	Y	Y	Y	Y		Y			Y					Y	Y	Y									
	BARS		**Y**		**Y**			**Y**	**Y**	**Y**	**Y**	**Y**				**Y**			**Y**					**Y**				**Y**					
	NRWS			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y		Y	Y	Y				Y					
	PUMA		Y	Y																													
JAYS	BLJA						Y																										
TITMICE	BCCH						Y																										
NUTHATCHES	RBNH						Y																										
CREEPERS	BRCR		Y																														
KINGLETS	GCKI	Y			Y																												Y
	RCKI		Y	Y					Y																								

FAMILY	Species	07-Apr-11	26-Apr-11	03-May-11	05-May-11	09-May-11	12-May-11	18-May-11	26-May-11	29-May-11	01-Jun-11	03-Jun-11	06-Jun-11	08-Jun-11	10-Jun-11	11-Jun-11	12-Jun-11	21-Jun-11	23-Jun-11	24-Jun-11	30-Jun-11	05-Jul-11	07-Jul-11	12-Jul-11	13-Jul-11	26-Jul-11	04-Aug-11	19-Aug-11	08-Sep-11	09-Sep-11	14-Sep-11	23-Sep-11	18-Oct-11	01-Nov-11
THRUSHES	VEER		Y						Y																								
	HETH		Y																														
	AMRO	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y		Y			Y	Y					Y				Y		
MIMIC THRUSH	BRTH									Y			Y	Y	Y																			
	GRCB						Y																											
PIPITS	AMPI																														Y		Y
WAXWINGS	CEWA																					Y					Y				Y			
STARLINGS	EUST	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y								Y	Y	Y	Y		
VIREOS	SOVI		Y																														
	WAVI								Y	Y																							
	PHVI						Y		Y																								
	REVI						Y		Y	Y	Y																						
WARBLERS	NPWA		Y	Y					Y	Y																							
	YEWA		Y	Y				Y	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y			Y											
	BTGW		Y						Y																								
	BTBW						Y		Y																								
	BPWA								Y	Y	Y																						
	BWWA								Y																								
	CRWA								Y																								
	MYWA		Y	Y	Y	Y																								Y	Y		
	CSWA						Y	Y	Y																								

FAMILY	Species	07-Apr-11	26-Apr-11	03-May-11	05-May-11	09-May-11	12-May-11	18-May-11	26-May-11	29-May-11	01-Jun-11	03-Jun-11	06-Jun-11	08-Jun-11	10-Jun-11	11-Jun-11	12-Jun-11	21-Jun-11	23-Jun-11	24-Jun-11	30-Jun-11	05-Jul-11	07-Jul-11	12-Jul-11	13-Jul-11	26-Jul-11	04-Aug-11	19-Aug-11	08-Sep-11	09-Sep-11	14-Sep-11	23-Sep-11	18-Oct-11	01-Nov-11
	MAWA						Y		Y																								
	BAWA		Y				Y		Y																								
	NOWA																																
	WIWA								Y					Y	Y	Y																		
	ARWA								Y																								
	CAWA						**Y**																										
	OVEN						Y																										
	NAWA						Y																										
	PAWA																													Y	Y		
BLACKBIRDS	**BOBO**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**Y**	**Y**				**Y**									
	RWBB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y								
	COGR	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y										
	BHCO		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y											
	BAOR						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y		Y						
FINCHES	AMGO						Y	Y	Y																		Y	Y				
SPARROWS	CHSP		Y				Y	Y																									
	SAVS		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y								
	FOSP		Y																														
	SOSP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y			Y	Y				
	SWSP			Y																													
	WTSP		Y	Y	Y	Y	Y	Y																							Y		
	WCSP						Y	Y		Y																							
JUNCOS	DEJU		Y	Y																										Y	Y		